THE TWO GREAT QUESTIONS

THE EXISTENCE OF GOD
AND THE
IMMORTALITY OF THE SOUL

LYSANDER HILL

THE TWO GREAT QUESTIONS

THE EXISTENCE OF GOD AND THE IMMORTALITY OF THE SOUL

BY

LYSANDER HILL

CHICAGO
REGAN PRINTING HOUSE
1909

DEDICATED

TO EDITH, MY WIFE.

PREFACE

The *Atlantic Monthly* for September, 1909, contains (pp. 335-341) an article by Mr. George Hodges, on "The Expectation of Immortality," which is of great interest in view of the arguments and conclusions set forth in this volume. Mr. Hodges' article relates to the ten lectures already delivered at Harvard University on the Immortality of Man, under the provision of a foundation established by Mr. George Goldthwait Ingersoll for a lectureship on that subject. The lectureship permits a free discussion of the great question, and has resulted in the delivery by well known thinkers of a series of annual essays on the question whether there are, or are not, any *proofs* of Man's immortality.

Mr. Hodges divides the ten lecturers into five classes—two, Professor Ostwald and Professor Osler, physicists; two, Professor William James and Professor Royce, psychologists; two, Mr. Dole and Dr. Crothers, Unitarian ministers; two, President Wheeler and Dr. Bigelow, illustrating the theme by reference, respectively, to the religious ideas of ancient Greece and of modern India; and two, Dr. Gordon and Mr. John Fiske, classed by Mr. Hodges as philosophers.

The two physicists are unable to find in their department anything confirming or even suggesting the notion of immortality—although one of them expresses his belief in it. Mr. Fiske sees in the inability of the physicists to affirm immortality nothing which raises the slightest *prima facie* presumption against it; but he agrees with them in the opinion that it is impossible to prove the immortality of man from the facts with which the physicist deals, and he finds it equally impossible even to imagine the conditons under which such an everlasting life might proceed. He considers the whole subject as necessarily confined to the domain of psychology.

The two psychologists believe in the immortality of the soul. Professor James finds in the materialistic formula, "thought is a function of the brain," no objection to our faith in immortality; for the brain-function may be merely the function of transmitting thought instead of the function of producing it. Professor Royce finds in the consciousness of individual personality unanswerable proof that something exists within us which is not physical and which we call the soul.

The theologians, including Dr. Gordon, believe of course in our possession of an immortal soul. They base their expectation of immortality upon the fundamental assertion of the being of God; upon the reasonableness of the universe; and upon the assertion of the worth of human life. They concur with Professor Royce in the opinion that personality is one of the most precious facts of human life, and with Professor James in the conclusion that there is a life of the spirit, apart from the life of the body; and they believe that life to be of too great value to be limited to the conditions of earthly existence.

Mr. Hodges does not state the conclusions reached by President Wheeler and Dr. Bigelow. Of the eight thinkers whose conclusions he does state, six acknowledge their belief in a future life, and two, as to be inferred from Mr. Hodges' report, are non-committal on the subject.

The two physicists, of whom one believes in a future life although unable to prove his belief well-founded, content themselves with the assertion that we can learn nothing about the subject from the processes of physical research.

But are they correct in that conclusion? Undoubtedly, they thought they were when they wrote their lectures; but since that time, recent as it is, much has been learned from physical research. It has been learned, for example, that thought is not originated by the brain, nor by any part of it, but by an immaterial something which uses the brain for the purpose of giving thought expression. With that additional knowledge, which was not available to them at the time when their essays were written, it can no longer be said that the processes of physical research teach us nothing bearing on the subject of man's immortality. The recent discovery, that thought is not originated by the brain, is an unequivocal confirmation of the views of Professor James, Professor Royce, and the theologians.

And did the two physicists give heed to nature's evidences of the existence of God? If they did not, it is no wonder that they failed to find, in their department of research, any evidence of man's immortality. If, for instance, they had previously reached the unalterable conviction that the processes of nature can be explained only in terms of evolution, their minds were already so preoccupied as to be practically incapable of considering the subject of man's immortality.

It has been my purpose, in writing this volume, to outline the whole scientific argument upon the two great questions of God's existence and man's immortality—two questions so indissolubly connected that the answer to either is the answer to both.

Lysander Hill.

Chicago, September 6th, 1909.

ILLUSTRATIONS

INDEX

CHAPTER I.

CHAPTER V.

CHAPTER VI.

CHAPTER VII.

CHAPTER VIII.

CHAPTER IX.

CHAPTER X.

CHAPTER XI.

CHAPTER XII.

CHAPTER XIII.

CHAPTER XIV.

CHAPTER XV.

CHAPTER XVI.

CHAPTER XVII.

CHAPTER XVIII.

CHAPTER XIX.

CHAPTER XX.

PART II.

CHAPTER XXI.

CHAPTER XXII.

CHAPTER XXIII.

CHAPTER XXIV.

APPENDIX.

CHAPTER I.

Introductory.

That the works of nature present strong evidence of the existence of an intelligent Creator, is a truth which has long impressed itself with greater or less force on millions of observing and reflecting minds.

But it is also true that there are millions of other persons equally as intelligent, observant and sincere, who are not yet convinced, beyond a reasonable doubt, as to the existence of God and the immortality of the human soul. If we could look into the hearts of men and read their secret thoughts, doubts and misgivings, we should be amazed to find to how great an extent, among the intelligent laymen of the Church, and even among its authorized teachers, that state of mind which is termed religious belief is really not belief at all, but merely religious *hope*. For men cannot truthfully be said to believe that of which they are in a constant condition of uncertainty. Men do not believe in the existence of God as they believe in the existence of their king, nor in the certainty of a future life as they believe in the certainty of physical death.

The causes of such widely-prevailing scepticism and uncertainty are not difficult to discover; nor can it be regarded as unreasonable that men should insist upon competent evidence before accepting as true propositions of such enormous import to the human race. For "no man hath seen God," nor do our physical senses give us any direct evidence of His existence. That which the Church relies upon as revelation was written by man thousands of years ago. The assumption that the writer was "inspired" rests upon nothing but his own statement, and, in most cases, it has not even that feeble and unsatisfactory support; so that large portions of the alleged "revelation" come to us without either internal or external evidence of truthfulness or authority. To add to the growing doubt, the most important parts of the Book of Genesis, including those which profess to give a history of the creation of the earth and its inhabitants, the fall of man, and the great Deluge, have, within the last hundred years, been so entirely discredited by critical research and scientific discovery that scarcely an intelligent person can now be found, even among the ministry, who does not regard them as merely a collection of ancient Assyrian and Babylonian myths and nursery tales, possessing no historical value whatever. So, also, the conclusions of science, anterior to the last four centuries, have been found to be mere speculations and guesses, entitled to no credence, and possessing little interest to the present age except as historical curiosities and as revealing the density of the ignorance and error through which the race has been obliged to struggle upwards to the present age of comparative light. Even the details of history itself have been so largely discredited that few careful writers of the present day are willing to accept them as anything more than surviving rumors or traditions current at the periods when they were severally reduced to writing. We have but just begun to realize that the histories of wars and political intrigues have been composed by, or at the command of, the victors, and with the unfairness universally characteristic of partisanship, prejudice or self-interest. The fact that these things have been becoming in recent years more and more generally known, explains why the modern mind is conspicuously and justly sceptical as to the authority of ancient beliefs, records, and reasonings, and why the Church is called upon, with ever-increasing urgency, to establish by rigid methods of scientific proof the existence of God and the immortality of the human soul, if it can be done. And surely it can be done if there is a just God; for it is inconceivable that He who alone possesses the power to make Himself known to mankind should have willed to remain unknown and yet to hold man responsible for not believing in His existence. If there be a just God, He must have left accessible to us evidence of the most conclusive character to prove His existence and His relation to ourselves. Nothing less than this can satisfy that intuitive feeling of justice and right which all normal men have inherited as a fundamental element of their being.

But, to the universal demand for light and certainty, the Church responds by producing, not evidence, but only its so-called revelations alleged to have been given to a few isolated individuals in a dark and remote past, and by requiring that the world shall accept them as true on pain of eternal damnation. And it wonders that men still doubt; that the doubt still spreads; that old established and long-flourishing theological schools like that of Andover, founded in the unquestioning faith and pious consecration of devoted believers in the not very remote past, are obliged to close their doors for want of students: and that, in the greatest intellectual freedom and enlightenment that the world has ever known, it seems to be drifting into hopeless scepticism and irreligion.

It cannot be denied that the present outlook is seriously disquieting, not only to those who adhere to the ancient conservatism of theological teaching, but also to all who believe that true religion is essentially necessary to the right upbuilding of our social and political institutions and to the secure establishment of universal morality and rectitude; nor can it be denied that it is imperatively the duty of all who realize the dangerous tendency of modern free thought towards religious scepticism to unite their efforts to counteract that tendency by establishing, beyond the possibility of further doubt, the supreme fact that God lives and governs the universe. For, until that fact be conclusively established, there is no sure foundation for religious belief, and no certainty of truth in any theory of the origin, nature, or ultimate destination of man: but human thought will continue to be left, as it is today, hopelessly drifting about upon an uncharted sea of speculation, without rudder or compass to direct, or pole-star to indicate, its true course. But with the knowledge of God's existence and government established beyond the cavils of unreasonable scepticism or reasonable doubt, all minor questions may then safely be left to the arbitrament of the future. They concern only non-essentials, upon which the minds of men will be gradually drawn together. Under the influence of free discussion, advancing intelligence, and growing toleration of the opinion of others, whatever is unsound or harmful will become eliminated, and whatever is wholesome or true will survive. When men learn to conduct religious investigation as they have already learned to conduct the investigation of scientific questions, as a band of brothers united for the discovery and establishment of truth, for the sake of truth alone, the progress of the world in religion will be as rapid as it now is in science. May that day soon come!

From the nature of the case, it is only to science that we can look to prove indubitably the existence and government of God and the nature and destiny of the human soul. Theology has failed to do it, and will always fail; because the existence of God, while necessarily the foundation of all theological systems, is itself in the nature of a scientific fact, provable only by scientific methods. It is fairly within the province of theology to criticise the facts and reasonings upon which science endeavors to found its conclusions; and happily, science welcomes criticism when given in good faith to assure the avoidance of error: but theology can be of little assistance to science in that way, for the reason that theologians, like other mortals, are too ready to accept without criticism any sophistry that appears to support their own theories. Metaphysical philosophy is of no service at all in such an investigation. In twenty-five hundred years of effort, it has contributed nothing that is of the slightest value, but has only succeeded in tangling up human thought in the convolutions of dialectic polemics. It may be regarded as heretical to say that neither metaphysics nor so-called revelation has proved anything of the existence of God or the immortality of the soul; but it must be said. The prevailing scepticism is conclusive of the fact.

From the scientific standpoint, there is nothing incredible in the theory of a direct personal revelation from God to man, provided it first be proved that there *is* a God to make such a revelation. The evidential weakness of all the alleged revelations that we have is inherent in the fact that the story of their origin comes down to us not only supported by human testimony alone, but by human testimony of the most suspicious character. They remained for ages exclusively in the custody of a priesthood which could easily shape them to suit its own interests. In the hands of that priesthood, they were used as title-deeds of divine authority in the Church over the souls and bodies of men, and became productive of enormous revenues and consequently of almost unlimited temporal power. The great temple at Jerusalem, destroyed during the Roman siege, A. D. 70, was one of the wonders of the world in its wealth and magnificence. Such has been the invariable product of all revelations relying for their genuineness upon the testimony of man, whether Buddistic, Braminic, Assyrian, Egyptian, Hebraic, Babylonian, Zoroastrian, Moslem, Peruvian, Aztec, or Mormon. "By their fruits ye shall know them" is one of the wisest maxims ever devised by human experience. The fruits of all these pretended revelations have been the acquisition of wealth and power by the priests, the multiplicity of alleged deities, great and little, the production of religious wars and bloodshed, the suppression of personal and spiritual freedom, priestly opposition to independent inquiry and to the increase and diffusion of knowledge among men, and the contrivance of rites and penalties whose fiendish cruelty almost defies description. The wonder is, not that the world now refuses to believe any revelation that is accredited only by human testimony, but that it ever could have been so simple and credulous as to believe, without absolutely conclusive proof, that such pretended revelation was communicated to man by inspiration from God. The history of the Mormon church, however, shows that even in this present era of light great numbers of men can be easily humbugged into accepting pretended revelations without the slightest showing of credible evidence in their support.

But the works of nature come with a revelation in which man has taken no part and can take no part. It comes to all ages and to all men. It needs no priesthood to interpret it, and holds out no inducements of wealth or power to those who accept it. It antagonizes no religious organization already existing, prescribes no rites or ceremonies, interferes with no man's personal liberty or advancement, and promotes, rather than obstructs, the progress of the human race toward universal brotherhood and charity. It teaches us, authoritatively and impressively, that even the meanest of creatures is entitled to "life, liberty and the pursuit of happiness," so long as it does not interfere with the equal rights of others, or threaten the welfare of the whole. And it affirms the existence and government of God, and proves it conclusively by evidence that all can verify and understand.

The great question on which the enquiring mind desires reliable and positive information is, whether the works of nature, themselves, came into existence by chance, or by the automatic operation of the natural forces apparently inherent in all things, or whether, on the other hand, they were caused to make their appearance in the universe by the volition and action of a great creative Intelligence presiding over nature and controlling what we call its "laws." This is an all-comprehensive question, the answer to which has been and will be awaited with anxiety.

The works of nature are quick to respond fully and satisfactorily to the inquiry. Her inanimate works—the beautiful constellations, the wonderful solar system, the majestic mountains, the broad expanse of ocean, the resistless fury of the tempest, the waving banners of the aurora, the orderly recurrence of the seasons—are impressive, and suggestive, of the existence of God; but, alone, they do not *prove* it. Not till we turn to her animate works, do we find conclusive evidence of God's existence; but, in them, it is so abundant and complete as to leave nothing more to be desired—it is as though the Creator had written His own autograph upon them for the eternal verification of His handiwork. And it is then that we fully realize, in contemplating the inanimate works of nature, the revelation of His Eternity and Omnipotence. Animate and inanimate are bound together in one great Bible, open and free to all.

There is no element of novelty in any attempt, in the present age, to interrogate nature as to her evidence of an intelligent Creator. It was demonstrated in Paley's masterly work on Natural Theology, published in 1802, that the array of proofs from nature's works, tending to elevate the theological dogma of Divine Creation from the position of a mere speculative hypothesis to that of an established scientific fact, was overwhelming and apparently conclusive. In Paley's treatise, no question as to the *origin* of Life on the Earth was discussed, and no doubt suggested as to the correctness of the general belief prevalent at that time that in the beginning man and the other animals suddenly made their appearance in the world, fully developed and ready for their respective careers. Those subjects were not within the province of Paley's discussion; and, at the time when his book appeared, to have entered upon them would have been unnecessary if he concurred in the prevailing belief, and unwise if he opposed it. For, the writings of Tom Paine and the insane irreligion of the French Revolution had both disgusted and exasperated the majority of thinking men, and had excited against unbelievers and sceptics a degree of opprobrium that practically amounted to persecution. In 1809 the appearance of Lamarck's work on the progressive development of animal life opened immediately a bitter controversy between the supporters of the ancient theology and the Lamarckian sceptics, in which the questions whether life on Earth originated by chance or by Divine decree, and whether vegetable and animal forms suddenly came into existence at the beginning in their full maturity or were gradually evolved from lower primordial forms, were the principal topics of contention. The controversy lasted for fifty years until the Darwinian theory of the development of animal and plant forms by variation and natural selection supplanted that of Lamarck and inherited the right to continue the controversy which he had begun.

The situation today is entirely different from that of 1802. Then, it was both unnecessary and impolitic to entangle the question of Divine creation with the further and different question as to whether the book of Genesis must be received as the inspired Word of God; now, the two questions can no longer be separated. The Darwinian Theory has conquered for itself a strong and permanent hold upon the judgment even of devout churchmen. The "higher criticism," and a profound and conscientious investigation of the channels through which the supposed Mosaic revelation of man's creation came down to us, have practically destroyed the authority of Genesis, and have remitted it to the category of ancient Assyrian myths and folk-lore. In such circumstances, no argument from alleged instances of creative design found in the works of nature can stand for a moment unless it can show, at the same time, that the facts alleged are true and cannot be scientifically accounted for on Darwin's Theory of Evolution. It was, in part, because Paley, in his great argument did not and, in fact, could not, anticipate the objections which, fifty-seven years later, Darwin would raise to many of his instances of supposed design, that his work failed to achieve enduring success. Yet, many of his arguments were, when he wrote them, and will forever remain, absolutely unanswerable, because the particular instances cited prove the existence of creative design, and cannot be explained on any other theory. I have taken the liberty to avail myself of certain passages from his treatise, where the descriptive matter was particularly clear and convincing; and I commend his book to all who would be interested in reviewing the great accumulation of evidence that he so ably presented on this important subject.

The scope of the present work is quite different from that of Paley's treatise. Since 1802, the progress of scientific investigation and discovery has been more remarkable than at any other period of the world's history, and many things have become familiarly known that were not dreamed of in Paley's time. These recent discoveries have opened up a vast field rich in proofs of Creative intelligence and forethought and entirely beyond the limited range covered by Darwin's Theory, which does not even profess to be a general theory of evolution. I shall call attention to the modest and wholly-reasonable claims of its celebrated author; and to the significant fact that some of his most learned and competent disciples have discovered clear evidence of the existence of *an unknown underlying cause, deeper and more far-reaching than the laws of evolution,* which must be reckoned with before the Darwinian Theory can be regarded as finally established. But, with that theory, which undoubtedly explains many, although not all, of the phenomena of animal and plant development, I have no controversy. If I criticise the reckless and unsupported assumptions made by certain of its over-zealous advocates, it is not because of any covert opposition to the theory itself, but only to prevent it from being misrepresented and possibly misunderstood. The labors of Darwin and of his true disciples have not in the slightest degree weakened the evidence of God's creation and control of the works of nature, but, on the contrary, have strongly fortified it, both by stripping away irrelevant and incompetent matter, and by showing that the remainder, thus purified, is able to stand the test of the most searching investigation.

The same evidence that demonstrates the existence, eternity and omnipotence of the Creator goes far toward establishing the probability of the existence and immortality of the human soul; and, when supplemented by other known facts, the combined proofs practically place the conclusion beyond a reasonable doubt. The discussion of this branch of the subject will not be exhaustive, but will be only sufficient to render apparent the demonstrative nature of the argument, and to indicate the character and sources of the supplementary proofs, leaving others to fill them in afterwards from time to time as they shall come to hand.

In a work of this kind the main difficulty results from the overwhelming abundance of the proofs. It is impossible to consider them all, and we are therefore necessarily restricted to the selection of a comparatively few exampls from which to judge the whole. Brevity of description also dictates the selection of examples with which the reader is already familiar or can easily make himself familiar. Hence, after citing a few instances peculiarly illustrative of Creative design in the construction of some of the lower animals, I shall draw my materials largely from the wonderful contrivances found in the human body, with which we are all familiar. Further on, we will consider some of the evidences of design in the inanimate works of nature; and lastly, psychology will contribute its quota of proofs. I approach the investigation profoundly impressed with the conviction that the conclusions which we shall reach must be fortified with reasons and evidence so strong that neither scientific doubt nor religions bigotry can successfully assail them. And it is with entire confidence that the views set forth in the following pages will stand this extreme and final test that I present them to the public.

CHAPTER II.

Evolution and the Darwinian Theory.

In the following discussion, it will be necessary to refer frequently to the great work of Charles Darwin on the *Origin of Species,* first announced in 1858, and published in 1859; and, incidentally to the writings of some of his most distinguished disciples and commentators. Darwin was not the first to announce a theory of evolution. The Greek philosopher, Anaximander, who was born 611 years before Christ, is clearly entitled to that honor. But like most original suggestions, its appearance was premature; the world was not ready to receive it; and it was at first embodied in a crude form in which it did not commend itself to the thinking mind. The intellectual world turned its attention away to the speculations of metaphysical philosophy and the fictions of religious dogma, and for twenty-five hundred years, the principle lay, abandoned and unnoticed among the mummies of ancient thought, like the body of Rameses shut up in its forgotten tomb, until finally the nineteenth century broke the seals of the crypt and its occupant was discovered to be of royal lineage. When, in 1809, Lamarck published in Paris, his theory of the progressive development of animal life, the French naturalist, like the Greek philosopher, failed to discriminate between fact and fancy, and undertook to account for the origin of life upon the absurd hypothesis of spontaneous generation. His labors, like those of Anaximander, failed at first to impress the public as of any great value or importance; although they have more recently attracted attention by reason of the fact that he anticipated some of the ideas afterwards put forth more successfully by Darwin.

Charles Darwin did not borrow from Anaximander or Lamarck his celebrated theory of animal and plant development, but was led to it by his own observation and reflection. Like most thinking persons, he had long felt that the account given in Genesis of the creation and fall of man was mythical; and when, during the famous voyage of the Beagle, he discovered facts indicating that the present species of animals and plants are lineal descendants of earlier and quite different species, he began to devote his life to the study and investigation of animal and plant development, in order to ascertain, if possible, the natural causes which control the transmutation of one species into another. To this end, he visited the various regions of the globe, both north and south of the equator, extending his studies to all forms of life, whether on land or in the water, and whether now living or known only by their fossil remains. His powers of observation and analysis were extraordinary, his industry untiring, and his judgment singularly calm and true. When he was fifty years of age, in the full maturity of his powers, he gave to the world the results of his investigations, and the conclusions at which he had arrived, together with the arguments in support of those conclusions, in a book, (The Origin of Species), which has profoundly affected human thought on the subject of animal and plant development.

His book set forth no scientific theory of the origin of physical life itself, but in the plainest words stated his belief that it emanated directly from the Creator, who breathed it into a few forms, or perhaps into only one, a lowest form of life, from which all subsequent forms were evolved by natural processes of development. This theory was irreconcilable with the statements of the Book of Genesis, and immediately evoked a storm of criticism from leading churchmen on the ground that it was heterodox and tended to unsettle the foundations of religious belief. In fifty years, the storm has spent its force. The views of Darwin have prevailed over theological bigotry. The "higher criticism" has destroyed the authority of Genesis as an assumed revelation from God; and now there are few even among the clergy who look upon it as anything more than a collection of myths venerable solely for their antiquity.

The Darwinian Theory, therefore, now presents itself to our consideration merely as a scientific discussion of the causes which have contributed to the great diversity of animal and plant forms. As a scientific theory, it must stand or fall upon the facts that it is able to show. It starts with a living physical body, and deals only with the influences which Mr. Darwin believed to have enabled that body, in the long course of millions of years, and by the natural processes of growth and reproduction alone, to have developed into the countless varieties of animal and plant form that now people the land and waters of the globe. It does not admit the possibility of sudden and great changes of form; for that would destroy the very foundation upon which Mr. Darwin's Theory rests, and would justify the belief in creative interference with what are called the "laws of nature." It does not acknowledge creative interference at any point along the line of descent, but relies entirely upon the slow modification of the ancestral form by successive slight variations in its descendants. Thus it is not a theory of origins, but a theory of adaptation and non-adaptation, and of consequent survival or extinction.

From a masterly work on Evolution, published in 1883, by Mr. Darwin's friend and fellow member of the Royal Society, Professor Andrew Wilson of Edinburgh, I take the liberty to quote an admirable compendium of Darwin's celebrated Theory. Professor Wilson says:[1]

"It is an easy matter to summarize, in a series of propositions, the chief data upon which Mr. Darwin's theory rests. These propositions are as follows:

Firstly. Every species of animals and plants tends to vary to a greater or lesser degree from the specific type. No two individuals are alike in every respect; each inherits from its parents a general likeness or resemblance to the species, whilst it tends at the same time to diverge from the parental form.

Secondly. These variations are capable of being transmitted to offspring: in other words, by natural laws of inheritance, the variations of the parents appear in the progeny along with the natural characters of the species. This much is proved in the "artificial selection" by man, for breeding, of those animals whose character it is desired should be transmitted to offispring.

Thirdly. More animals and plants are produced than can possibly survive. Each species tends to increase in geometrical progression, and all the individuals produced could not find food, or even surface-area whereon to dwell.

Fourthly. The world itself (*i. e.* the surroundings of animals and plants) is continually undergoing alteration and change, represented by climatal variations, the rising and sinking of land, etc.

Fifthly. There ensues a "struggle for existence" on the part of living beings. Over-population means a struggle for food and for other conditions of life, such a consideration being really the doctrines of "Parson Malthus" applied to the animal and plant worlds at large. Hence it follows that as

[1] *Chapters on Evolution* (G. P. Putnam's Sons, New York, 1883), pp. 7, 8.

some forms will be better adapted (by variation) than others to their surroundings, the former will come to the front in the struggle. Nature, so to speak, will "select" those individuals which will best adapt themselves to their surroundings, and will leave the rest to perish. This is the "survival of the fittest." The change of surroundings, already postulated, will further induce and perpetuate variations in these individuals which survive.

Sixthly. A premium is thus set by nature upon variation, inasmuch as the varying and surviving individuals will transmit their peculiarities to their offspring.

Seventhly. Thus "varieties" of a species are first produced; the "varieties" becoming permanent, form "races;" and the "races," in time, differ so markedly from the original species whence they were derived, as to constitute new "species."

Eighthly. Past time has been, to all intents and purposes, infinite. Hence it is probable that the existent species of animals and plants have been evolved (through "natural selection," acting through long periods of time) from a few primitive and simple forms of life, or possibly, from one such form alone."

These eight propositions constitute, in substance, Darwin's Theory of Evolution. We shall see hereafter how important it is to our discussion—important not so much by its scope as by its limitations; not so much by reason of the facts which it accounts for, as by reason of those which it does not and cannot account for. It serves the purpose of narrowing the field of discussion by grouping together and eliminating all the points that have been settled and leaving only two remaining for consideration. On those two points—"variation" and "natural selection," the very foundations of the Darwinian Theory—the scientific world, after fifty years of investigation, has not been able fully to confirm the conclusions reached by Darwin. Marked variations sometimes suddenly occur, creating new "buds" on the tree of life which cannot be accounted for on his Theory; and "natural selection" does not always explain either the persistence or the disappearance of organs or forms.

CHAPTER III.

CONTRIVANCE PROVES THE ACTION OF MIND, AND IS THE KEY THAT UNLOCKS THE GREAT SECRET OF THE UNIVERSE.

In the course of this work, we shall have frequent occasion to refer to the subject of contrivance and invention, and particularly to those classes of inventions which the laws of Great Britain and the United States denominate "combinations" and "processes." The nature and characteristics of the act called invention have been more deeply and exhaustively considered by the courts of England and America than have those of any other act performed by the mind of man. In both countries, the subject, in almost every conceivable form, has often been reviewed by the highest courts—in England, by the law judges of the House of Lords, and in America, by the Supreme Court of the United States—courts consisting of men of mature age, selected from the whole nation by reason of their profound judicial learning and wisdom and their extensive experience. In their deliberations concerning the subject of invention, they are assisted by the arguments of counsel specially learned in this department of knowledge and thought, and by the testimony of scientific experts familiar with the subjects under consideration. Each judge has at hand all the opinions and reasonings of all his predecessors, as well as the opinions of all the lower courts, some of which are composed of judges no less renowned for ability and learning than the judges of the court of last resort. It is evident that the conclusions reached concurrently by these hundreds of great minds as to the characteristics and proofs of the act called "invention," can be safely adopted by us as authoritative and final; and I shall have no hesitation in relying upon them. Whenever, in the course of this treatise, reference is made to the act of invention, or contrivance, it will be understood that the word is used in its strict legal sense as defined by the courts above referred to.

The unanimous conclusion of these impartial and able tribunals, approved by the universal judgment of mankind, is, that invention[1] is an act of the intellect, the intelligence, the mind; that it is a *creative* act, producing, in some cases, a thing before unknown, and, in other cases, something before known but by this act produced in a new way; and that the primary form of the act is that of a mental conception, which sometimes flashes upon the consciousness suddenly and unexpectedly, like lightning from a clear sky, and at other times is the result of slow and laborious mental effort, reasoning, and calculation. This conclusion is confirmed by all inventors. They testify unanimously that, in making an invention, they are conscious of mental action, and of its production of the new idea—even when it is evolved suddenly and unexpectedly. With the "mind's eye," consciousness, they actually *see* the act performed. Thus, whenever and wherever invention is found, it proves conclusively the exercise of mind, because it can come into existence only through the exercise of the mind.

Let us now take up a few classes of inventions, and consider the nature of the mental act by which they are produced. I will first mention the familiar class in which the invention is a "mechanical combination," or, in legal phraseology, con-

[1] The word "invention" is used in two different senses, to-wit, (1) as implying the *act* of invention, and, (2) as implying the *thing produced* by that act. Thus, we speak of Morse's conception of the electric telegraph as an invention, and of the electric telegraph itself as an invention. The context will always indicate in which sense the word is used.

sists in the combination of certain mechanical elements (parts) cooperating to produce a desired mechanical result. In this class of inventions are included such things as sewing-machines, looms, timepieces, pumps, carriage wheels, windmills, pianos, organs, and thousands of other well-known machines and implements. To produce any of these things the first inventor had to know its purpose, the kind of materials of which it would necessarily be composed, the qualities and strength of those materials, the natural laws or principles upon which the machine must operate, and a great number and variety of other facts of nature or art. Consider, for example, the musical organ: Desiring to produce a new and superior musical instrument, the inventor selected the principle of the flute, in preference to that of the harp; to achieve orchestral effects, he multiplied the pipes and varied their pitch and quality; with numerous pipes, he had to devise means for blowing them mechanically, and this resulted in the sub-combination of a bellows, a key-board, and the connecting mechanism by which each key should be able to operate a particular pipe; to get volume of sound, he had to increase the size of the pipes, and form them of some material more sonorous than wood; to secure evenness and steadiness of tone, he was obliged to combine with his bellows and pipes an air-chamber; devices had to be created for reducing or increasing, at will, the audible loudness of the sounds; the pipes had to be modified so as to receive the air at their ends; suitable forms of valves had to be designed; all these things had to be thought out, and then carefully coördinated to each other. Thus, we see that, in all its parts, and in every step in determining the form and construction of each part and its relation to every other part, the exercise of thought and of the creative power of the intellect was involved.

Or consider, as another example, the electric telegraph. Its effective instrumentalities are a galvanic battery or other means for exciting an electric current; a circuit wire; an electro-magnet with its armature; a spring; a marking-instrument; a strip of paper; means for moving the paper strip longitudinally; a circuit breaker, or "key," and a signal alphabet. These nine devices have no natural relation to each other, and all may exist independently without constituting a telegraph. But contrivance brings them *into* definite relations with each other, by arranging their positions so that they will all coöperate to produce a single joint result. To this end, contrivance connects the battery and electro-magnet to the circuit-wire, arranges the spring in such position that it will normally hold the armature out of contact with the poles of the magnet, but when slightly compressed will let it come into contact with them; connects the marking-instrument to the armature; arranges the paper strip so that the marking instrument when actuated will produce a mark upon it; places the circuit-breaker in the line so that by means of it the circuit can be opened or closed at will; and contrives an alphabet of dots and dashes such as can be made on the paper strip by the marking instrument. The telegraph is now complete and operative.

But it is easy to see that the parts would never have come into coöperative relation with each other accidentally or by chance. Several of them had to be prepared beforehand, in expectation of the use to which they were to be put; all of them had to be *arranged* in anticipation of such intended use. Nothing but *mind* can form an expectation, a purpose, or an intention. Wherever, therefore, we find clear evidence of contrivance, we find conclusive proof of the existence and action of mind. Contrivance is not possible without the operation of mind.

When we come to the consideration of those inventions which consist in a chemical process adapted to produce a new chemical product, the question becomes still more interesting. Unlike mechanical movements and combinations, the factors which enter into chemical action cannot be seen by the eye: for they are atoms and molecules[1], too minute to be detected by the highest powers of the microscope. We are ignorant even of their forms, and, unless they have actually been associated before, no one can know how they will behave when brought together, nor what qualities will appear in any product resulting from their union.

If our discussion involved only the processes and products of Inorganic Chemistry, no insuperable difficulty would be encountered; for the chemical analysis of inorganic compounds is comparatively simple and its results reliable. Inorganic Chemistry deals with the solids and the simple, and therefore stable, combinations of gaseous elements. All known inorganic substances have been analyzed, and their atomic composition ascertained; so that we are able, in many cases, to create them anew by synthesis of their elements.

Our discussion, however, will have to do, mainly, with Organic Chemistry; and here the difficulties are apparently insuperable. All organic substances owe their existence, as such, to vital processes; and as we are unable, either in observation or experiment, to follow the processes of life, we must remain forever ignorant of what they do or how they do it. Physical life has a chemistry of its own, whose laws and modes of procedure are not within our ken. Analysis does not disclose them, and synthesis is powerless without

[1] It is calculated that a molecule is less in diameter than one twelve hundred and fifty thousandth of an inch. They are composed of atoms at least one thousand times smaller; and these, in their turn, are composed of positive and negative electrons more than a thousand times smaller than atoms.

such disclosures. Organic Chemistry has but little to do with solids. Its main work is with the complex, and therefore correspondingly unstable, combinations of gaseous elements—combinations in which the displacement of a single atom is almost certain vitally to change the result. With such combinations, synthesis is practically impossible. It does not enable us to create a single drop of milk, of oil, of blood, of tears, of lymph, of saliva, or gastric juice, of bile, or of pancreatic juice, or a single particle of albumen, of gelatine, of bone, or any other organic constituent of the animal body. Although we can easily ascertain the kinds, and the quantitative proportions, of the atoms which compose them *as a whole*, yet we do not know, and cannot ascertain, the kinds and quantitative proportions of the different atoms that compose their several molecules, and, until this is known, synthesis is impossible.

There is a third group of inventions to which I will make brief reference here, in order that the continuity of the discussion may not be interrupted for that purpose further on. I refer to those in which the invention consists in a mechanical combination adapted to coöperate with a chemical product or process to produce a desired result. In such an invention its two component divisions, the mechanical and the chemical, are so absolutely foreign to each other in their nature and qualities that, *a priori*, one could not conceive of their coming into coöperative association except in response to the command of a controlling intelligence. Yet, in the works of Nature, we shall not only repeatedly find such an association of mechanical and chemical parts, but we shall find, for example, that each has been carefully adapted to the other—we shall find that the action of the mechanical part would be wholly useless and purposeless unless preceded or followed by the action of the chemical part. Each without the other, would be unintelligible, because useless and worthless—there would be no conceivable reason for the existence of either—but with such coöperation, the existence of both is fully explained, and the mind intuitively recognizes the purpose of their creation. When the two coöperating parts are clearly not natural growths, but artificial productions, it is as impossible for the human mind to doubt the obvious proof of intelligent design as to doubt its own existence. But suppose that upon further examination each of the two parts is found to be *a separate* invention; that the mechanical structure is made up of parts which have been carefully fitted to coöperate with each other to produce a certain result; that the chemical structure is made up of elements which have been carefully selected to coöperate with each other to produce another certain result; that the two separate and totally different results bear such a relation to each other as to show that they must have been foreseen and provided for with the intent that they should ultimately come together and coöperate for the production of a third result, which is the object of the entire combination, and then try to imagine how any proof of design more absolutely conclusive than this could by any possibility ever exist! The effort will be vain—for even a mathematical demonstration could have no stronger probative force. The sworn testimony of millions of disinterested and unprejudiced witnesses could add nothing to its weight. To refuse to believe it, a person must first renounce his own reason.[1]

[1] In the experiments of Professor Loeb and others on the artificial fertilization of eggs, it has been discovered that the eggs of certain low aquatic animals can be fertilized artificially; and the discovery has been heralded to the world, in the public prints, as a close approximation to, and forerunner of, the supposed approaching discovery of the origin of life. It is nothing of the kind. To discover how a living egg can be fertilized is a very different thing from discovering how the egg itself first came to exist, and whence came

It is *contrivance* that furnishes the key with which to unlock the mystery of creation. The universality of contrivance in the works of nature is one of its most striking and impressive phenomena. If contrivance were manifest only in one department of nature's works, or in but a few instances, some persons might not be impressed by it beyond the possibility of a reasonable doubt; but the evidence of it is literally found everywhere, and in the utmost profusion. A whole library of descriptive literature would hardly be sufficient to convey an adequate idea of its extent. It is simply inconceivable that if there was no contrivance in the works of nature, they should be found exhibiting innumerable and astounding proofs of contrivance everywhere.

And what has atheism to offer in answer to these overwhelming proofs of Creative contrivance? Nothing but the absurd conjecture of "spontaneous generation"—a form of words which, as explained by Professor Haeckel, its greatest living exponent, means that life was originated by the chemical action of matter upon matter. Haeckel argues that, as the minutest form of life is the living call (an invisible speck, whose diameter lies somewhere between the one hundred thousandeth part of an inch and the one hundred and twenty-fifth part of an inch) ; and as the cell is composed of chemical elements; and as he (Professor Haeckel) cannot conceive of a Creator; therefore, the chemical elements of the cell must have come together by chance, and must by their inter-action have produced the phenomena which we call life. And he feels so sure of this that he stigmatizes all who do not believe with him as having "renounced their own reason!"

its life-principle. Professor Loeb starts with an antecedent egg; there was no antecedent egg when physical life started—and the problem is, how to form the egg. An eternity of fertilization will never solve *that* problem.

He admits the impossibility of either proving or disproving his conjecture experimentally. But experimental proof is not the only form of proof; and a theory or guess which is incapable of direct experimental proof or disproof may be, and often is, indirectly disproved by establishing the existence of facts which are plainly inconsistent with it.

One fact of nature plainly inconsistent with the hypothesis of "spontaneous generation" is, the fact that the same identical elements and in the same identical proportions, that exist in the living cell, may be found existing together without life. It is a law of nature that chemical action, under the same conditions, is invariably the same; hence, if the concurrence of certain atoms or molecules, in certain definite proportions, ever produced life by their chemical action upon each other, then their concurrence must always produce life. But, as a matter of fact, it does not. It stands, therefore, proved that life did not originate by chemical action.

Only life can produce life. If we sterilize a bowl of meat broth and then seal it up hermetically tight, no life will ever appear in it, although it contains every chemical element necessary to life. In the body of a dog just shot and killed, every cell was instinct with life a few minutes ago; every chemical element that was in the cell then is in it still; but the life is not in it. Something that is not matter, nor the function of matter, nor the result of chemical action, has gone out of it, never to return. If these things are true, "spontaneous generation" cannot be true.

There is no theory which bridges the chasm between lifeless matter and the living cell.

But even if "spontaneous generation" were true, it would not account for the plain evidences of creative *contrivance*. "Spontaneous generation" does not produce a lung, or a heart, or the wonderful telegraph mechanism of a brain, any more than it produces a chronometer or a piano. In the creation of each of these organs, there was as clear and definite a purpose to accomplish, as there is in the construction of a pump or a steam engine; and the mechanical difficulties were solved with infinite skill.

The controversy between Religion and Atheism for recognition as the one great Truth of Truths is today, as it always has been, a battle over the question whether, on the one hand, the universe, with all that it contains, was created by an intelligent Creator, or whether, on the other hand, it was brought into existence by the action of blind chance. There is no middle ground on which to evade the issue; either Chance or God must be accepted as the Author of all things.

Science offers no encouragement to the atheist that his views will ultimately prevail. On the contrary, every new discovery made by it strengthens the argument against atheism. It is to science that we owe the knowledge of the structures which will be hereinafter cited as examples of Creative contrivance.

With these preliminary observations, I will now enter upon the discussion of Nature's revelation of the existence of God; after which, we will take up the question of Nature's revelation of the soul of man, and its eternal life in another and different sphere of existence.

CHAPTER IV.

Contrivance Shown to Exist in the Venomous Snakes, and not to be Accounted for by Darwin's Theory of Evolution.

The mind is that part of our being by which we think, reason, contrive, approve, condemn, know, inquire, doubt, believe and imagine. Through the power, or faculty, or whatever it be, that we call consciousness, these mental operations make themselves directly known to us at the time, and by the act, of their occurrence. Thus consciousness is a witness whose testimony, without the necessity of corroboration by the senses, is, so far as it goes, unimpeachable and conclusive.

By means of our power of speech, we are able to communicate to others the information which we receive from consciousness as to the operation of our own minds; and they are able, in like manner, to impart to us full information of the operation of their minds. From a study of the information thus obtained, we arrive at the knowledge that the powers or faculties of our mind are common to all minds, and spring from the very nature of mind itself.

In examining the works of nature to ascertain whether they furnish evidence of the operation of the mind, we encounter, at the outset, a serious difficulty, arising from the fact that nature is unacquainted with the language of man and cannot use it for any purpose whatever. She has no organs of speech by which to inform us whether she thinks, reasons, approves, condemns, knows, inquires, doubts, believes, or imagines. But there is one faculty of mind, the faculty of *contrivance,* which is able to express itself in works, without speech; and it is, therefore, to that faculty alone that we must confine our attention in the further prosecution of our inquiry. Contrivance necessarily implies something contrived; and that something, if afterwards constructed, may remain behind for our examination and study. Hence, if we can find in the works of nature things that can be accounted for on no other theory than that of contrivance, we know to an absolute certainty that those things conclusively demonstrate the existence of an intelligent Creator.

But, in considering the works of nature, we must be careful to place in the category of contrivances nothing whose existence can fairly and fully be accounted for on the theory of Evolution; otherwise, like the arguments of Paley and the authors of the Bridgewater Treatises, our labors may be inconclusive.

The question whether the works of nature exhibit clear evidence of intelligent contrivance will, therefore, now demand our attention.

I select as our first example the venomous serpent. Should any one inquire why the Deity created this class of reptiles, I am obliged to reply that I do not know—I am not sufficiently acquainted with the ultimate purposes of the Creator to be able to hazard any statement on the subject. Perhaps, as Gosse conjectures, it was to aid in maintaining the proper balance of animal life on the earth by thinning out the vermin that would otherwise multiply too rapidly, and to render their destruction comparatively painless through the paralyzing or stupefying effect of the quick-acting deadly poison. We need not even consider the question here, because it is entirely beyond the province of this discussion. It is certain that the class of venomous serpents was created, probably for some sufficient reason, and that it exists, under various forms, on all the large land-surfaces of the earth where the climate is not frigid throughout the year. It is certain, also, that it employs its venom-apparatus as a military weapon, for purposes of attack and defense.

That apparatus, in all venomous snakes, is constructed on the same general plan. In each side of the reptile's head, and in close proximity to the jaw, there is located a flexible bag capable of containing a few drops of fluid. The walls of the bag are a poison-factory, which secretes from the reptile's blood certain chemical elements (which are harmless when chemically uncombined in the blood), combines them together into an active poison, and filters it into the bag. From the bag, a duct extends to the fang, which projects downward from the outside edge of the upper jaw. The fang is constructed with a longitudinal passage or canal, extending from the delivery-end of the duct to, or nearly to, the sharp end of the fang. Around the bag are arranged several powerful muscles which are under the control of the snake, and which can, at its will, compress the bag and cause it to squirt the poisonous liquid through the fang into the wound made by it. For a long time it was generally believed that the fang was slightly movable longitudinally, and that, in the act of striking, it pressed upward against the bag, causing the latter to eject the poison into the wound; but this belief was fallacious, for it was afterwards learned that the snake can, and frequently does, use the fang for wounding without poisoning. In certain snakes, the fangs project so far that their ends extend below the jaw when the mouth is closed; and experiment has shown that, when they are in that position, the snake can at will eject poison through them without moving its jaws. In the cobra and certain other snakes, the fang is not movable independently of the jaw—it is at all times in position for striking.

I beg the reader to pause here and carefully consider this astonishing contrivance. Here is a chemical factory, constructed to separate from the animal's blood certain harmless ingredients and combine them together into a deadly poison. That they existed in harmless association in the blood, and that when combined by chemical action the result is a fatal poison, could not have been known to the snake's intelligence, nor to any other intelligence except that of the snake's Creator. The materials from which the bag was constructed were brought to the spot by the snake's blood (but without his knowledge or control) and converted into a chemical factory (called by the naturalists a "gland"), the function of which was designed to be to secrete from the same blood certain other elements and combine them into a poison. Merely bringing them together would not answer the purpose, for they exist together in the blood without uniting to form a poison. This fact, and their subsequent combination into a poison, can be rendered intelligible in accordance with the laws of chemistry only on one of two possible hypotheses, to wit: either (1) there must have existed with them in the blood something which prevented their chemical union into a poison, but, when rejected by the gland from association with them, left them free to unite; or else (2), when in the blood, some of them must have contained some element which had to be removed, or lacked some element which had to be added, to enable them to unite by chemical combination. Whichever of these hypotheses be the true one (and it matters not which), certain it is that the gland was constructed skilfully and intelligently to give it effect, and equally certain it is that the mind which planned the construction was familiar with the materials that were to be dealt with, and with the laws of chemistry, and knew how to make the vital forces execute his plans.

But we have considered only the chemical part of the combination—let us turn now to the mechanical part. The poison-bag and its chemical factory were of no possible use alone. To enable them to be used for what we now know to have been the purpose of their creation, or for any other conceivable purpose, they must be combined with mechanical elements. If the poison was to be used outside of the reptile's own body, there must be a means by which to deliver it from the bag. Accordingly, a discharge-tube was provided, and powerful muscles were arranged to compress the flexible bag and expel its contents through the tube. At this point of development, the bag and its discharge-tube corresponded exactly to one of man's well-known inventions—the sprayer which ladies employ to spray aromatic fluids upon their face and hands; which doctors employ to spray medicinal liquids upon diseased surfaces; and which sewing-machine people employ to oil their machinery. But the serpent's sprayer was intended for no such pacific purpose; on the contrary, it was designed (but not by the serpent himself) for a military weapon, and a very deadly one, at that. It was, therefore, combined with a tubular fang, capable of not only inflicting a wound, but also of furnishing a channel for conveying the poison deep into the wound, so as to ensure its destructive effect. In certain cobras, the poison is fatal to man within five minutes from its injection. In that species of serpent, the jaws are provided with a few small teeth for masticating purposes arranged farther back in the mouth than are the fangs. These teeth have no tubular passage, no sharp points, no connection with a poison receptacle, and are totally unfitted to perform any function like that of the fangs, while the latter are totally unfitted to perform the function of the teeth. Indeed, care has been taken to prevent them from interfering with the work of the teeth. To that end, they are arranged at the outer edge of the upper jaw, out of line with the teeth, so that they extend down outside of the lower jaw, and thus permit the true teeth to come together.

In the ratlesnake of Norh America and the terrible fer de lance of the Carribean Islands and South America, the poison-factory, flexible poison-receptacle, discharge-duct and muscles for compressing the bag to eject the poison, are constructed and combined as in the cobra; but the long, tubular, sharp-pointed fangs are *hinged* to the outer edge of the upper jaw, and combined with special muscles by which they can be turned up on their hinges, out of the way, when not needed for immediate use, or depressed for the purpose of putting an enemy *hors de combat.* This construction is, mechanically, in the nature of an improvement upon the weapon carried by the cobra tribe. When the fangs are turned up, they lie within, and nearly concealed by, the folds of the animal's upper lip. Note the new sub-combination of hinged fang and muscles for raising and lowering it at will which we find here, and consider whether it does not indicate the work of an intelligent designer!

All venomous snakes are constructed either on the plan of the cobra or on that of the rattlesnake. The general principle is the same in both.

It will be interesting and perhaps instructive to compare the weapon with which the snake has been armed by nature for purposes of attack and defense, and the weapon with which man has armed himself for similar purposes. Man's weapon, the firearm, like that of the serpent, brings into co-operative action the product of a chemical factory and the directing power of a mechanical tube. In both cases, a missile is to be shot from the assailant into the body of his victim, where it is to cause injury or death; and, in both, the peculiar construction of the gun and its missile is due to the widely-different materials that the two constructors were obliged to use. The stupid and unreasoning snake had not the intelligence nor the physical organs to create his gun or its projectile, and they had to be created for him; man had the necessary intelligence and organs, and created them for himself. The mind that planned the snake's contrivance was not embodied in a physical form, but knew how to control the vital forces of the snake itself and compel them to execute his plans; and therefore he availed himself of them to construct the reptile's gun and its projectile. He could not employ a solid projectile, and shoot it from the gun by the force of an explosion without destroying the snake itself; therefore he employed a liquid projectile and furnished the snake with the mechanical means to shoot it from the gun by the exercise of those means. But here a difficulty was encountered, which had to be surmounted by means of another invention—the liquid projectile could not make a wound, and was ineffective for its purpose without one. So the constructor employed the vital forces of the snake to produce a long, sharp and hollow fang, and led the discharge-end of the gun into it; and the reptile found itself now able not only to make a deep wound, but to drive the venom to the very bottom of it. On the other hand, man, in planning and constructing his invention, was not limited to the use of a liquid projectile, nor to the employment of vital force to drive it from the gun. A solid projectile could be employed as the means for making the wound; could be large enough to produce a fatal effect without the use of poison; and could be shot to a great distance by an explosive force acting in the gun itself. Hence, he employed his chemical factory to manufacture gunpowder instead of venom, and constructed his gun to withstand the explosive force of the powder.

Comparing the inventive intelligence and skill revealed in the two weapons, and considering the relative physical limitations of the two classes of creatures for whose use they were designed, I think that every unprejudiced person will agree with me in the opinion that superiority cannot be affirmed of the human invention. Each was admirably adapted to its purpose, and to the being that was to use it; but that found in the snake was absolutely perfect in both respects, and that of man was not. In the seven hundred and fifty years that have elapsed since the date of man's invention, he has greatly improved it in respect to the construction of the gun, the form and construction of the projectile, and the composition of the chemical employed as an explosive. There is no reason to believe that there has ever been any improvement, or that there is any room for improvment, in the apparatus used by the rattlesnake.

And now, what has Evolution to say about the invention employed by the venomous serpents? Evolution replies that its so-called "laws" *have never pretended to account for the original form or forms of animal and plant life,* but only for their gradual modification into other forms by small but cumulative variations; and that the survival of such other forms depends upon their superior utility as compared with preceding forms. Evolutionists say that the venom-gland (the chemical factory) is probably only a modification of a pre-existing salivary gland. But when asked how they know that there was a pre-existing salivary gland, they are obliged to admit that they do not know it—that they assume it as a fact and beg us to accept it as an explanation of the existence of the venom-gland. By the same kind of reasoning, if we asked them to account for the origin of the *salivary* gland, they could say that it is only a modification of the pre-existing venom-gland. In short, their assumption of such modification in this instance is all guess-work, and not entitled to be called science. They are guilty of a double assumption—first assuming the supposed pre-existing salivary gland, and then assuming that it accounts for the venom-gland.

Evolution is unable even to *attempt* to account for the long, sharp-pointed fang, or the longitudinal perforation through it, or the location of the fang at the outer edge of the jaw out of line with the teeth, or the connection of the venom-duct to the perforation through the fang, or, in the rattlesnake, the hinging of the fang to the jaw, or the creation of a set of muscles by which to raise and lower the fang at will. These are decisive evidences of intelligent contrivance—as decisive as anything that can be found in the whole range of man's inventions. Their coöperative adaptation clearly explains their purpose. We are not left to infer that purpose from what we subsequently know of their actual use—the moment we understand their construction and adaptation to coöperate with each other, we *know* their use—know it beforehand as well as we know it after seeing them used. They give present evidence, and conclusive evidence, of their constructor's intention and plan, and of the operation of his mind. There is nothing in Evolution that can account for them, any more than it can account for the firearm. They are the product of thought and skill—and with that conclusion we will leave them for the present.

CHAPTER V.

THE SPIDER AND THE BEES, WASPS, AND HORNETS. EVOLUTION AGAIN POWERLESS TO EXPLAIN.

The extraordinary mind that thus manifests the fullness of its inventive resources and its control over the vital processes of animal life, has given us innumerable proofs of both, as if to indicate to our comprehension the diversity of his powers, and the great interest that, for some reason unknown to us, he seems to take in the development of life, even in its humblest forms.

Thus, in the body of the spider there are found several inventions, some of which surpass the utmost ingenuity of man and have excited his amazement and admiration from the time when he first knew of them. Perhaps the most remarkable of these are the wonderful spinning apparatus and process by which the spider produces the gossamer filaments out of which he constructs the web that serves at once as a home for himself and a snare for his prey: "Remember," says the naturalist, P. H. Gosse [1] who seems to know the purposes of the Creator, "that the whole tribe is sent into the world to perform one business—they are commissioned to keep down what would otherwise be a 'plague of flies.' They are fly-butchers by profession; and just as our beef and mutton butchers have their slaughter-house, their steel, their knives, their pole-axe, their hooks, so are these little slaughterers furnished with nets and traps, with caves, with fangs, and hooks, and poison-bags, ready for their constant work. They have, in fact, nothing else to do: their whole lives are

[1] *The Microscope*, Ch. XIII.

spent in slaughtering—with the exception of rearing fresh generations of slaughterers—and I suppose they think, and are intended to think, 'of nothing else.'"

The spider's spinning apparatus is another example of nature's combining chemical and mechanical structures together into coöperative association for the production of a predetermined result—a species of invention that always requires great ingenuity in planning and extreme skill in constructing. In the particular example here cited, and to be described further on, the body of the insect is only a quarter of an inch in length; and yet, within the posterior parts of this minute form, the chemical factories or glands which elaborate from the fluids of the spider's bloodless body the materials which are to be spun into a cord are several hundreds in number, the cord is made up of at least half a dozen separately-formed strands, and the complicated machinery works in such perfect harmony that the little animal, if uninterrupted, will spin a net sixteen inches in diameter in less than three-quarters of an hour! And, in spinning the net, the spider produces, with this apparatus, not only the strands

[1] Stars and spiders have certain close connections. Some varieties of spiders are cultivated solely for their fine threads, which are used in astronomical research. No substitute for the spider's thread has yet been found for bisecting the screw of the micrometer used for determining the positions and motions of the stars. Not only because of the remarkable fineness of the threads are they valuable, but because of its durable qualities. Recently the set of spider lines in the micrometer of the transit instrument at the Alleghany observatory was examined and found to be in good condition, although they had been in service for forty-seven years. These threads withstood changes in the temperature so that in measuring sunspots they are uninjured, when the heat is so great that the lens of the micrometer eye piece is often cracked. The spider lines are only one-fifth to one-sixth of a thousandth of an inch in diameter, and make silkworm threads seem clumsy in comparison. Each line is made up of thousands of infinitesimal streams of fluid. In placing these lines in the micrometer experts operate with powerful magnifiers. The lines are placed parallel with each other and two one-thousandths of an inch apart.—*Chic. Sunday Tribune*, Dec. 6, 1908.

and cords, but two different *kinds* of cord—one for the cables that are to support the net and for the radii that extend from the centre to the periphery of the net; and another for the spiral or concentric lines that connect the radii and thus complete the net! And man, whose boast is, not that he can equal this wonderful apparatus, or even approximate it, but that he is able to *discover* that the spider actually possesses and uses it, has the presumption to doubt whether intelligent contrivance can be proved from the works of nature! And to prate about accounting for it on the theory of Evolution, when the laws of Evolution are utterly powerless to explain the origin of even *one* of the hundreds of glands employed in the apparatus! Evolution, as we have already seen, has its limitations, and they confine the field of its explanations within very narrow boundaries. It accounts for new structures only when they can be shown to have been brought into existence by the slow and gradual variation of antecedent structures.

I borrow from the interesting work of P. H. Gosse on the Microscope, the following description of the spider's spinning apparatus. After referring to the many varieties in the form of spider's webs, he says:

"The silk with which these various fabrics are constructed is a thick, viscous, transparent liquid, much like a solution of gum arabic, which hardens quickly on exposure to air, but can meanwhile be drawn out into thread. So far, it agrees with the silk of the silkworm and other caterpillars; but the apparatus by which it is secreted, and that by which it is spun, are both far more complex and elaborate than those of the latter. Generally speaking, there are three pairs of spinnerets, or external organs, through which the threads are produced, but in some few cases there are only two pairs, and in others, as the Garden Spiders *(Epeira)*, the hindmost pair seem to be united into a single spinneret. These are always situated at the hinder extremity of the body, and I will show them to you presently. First, however, I will describe the internal apparatus—the source of the threads.

"The glands which secrete the gummy fluid are placed in the midst of the abdominal viscera, and in some instances—as in the female *Epeira fasciata*, a species which makes a remarkably large web—they occupy about a quarter of the whole bulk of the abdomen. About five different kinds of these glands may be distinguished, though they are not all present in every species. The *Epeirae*, however, present them all.

"In this genus there are: 1. Small, pear-shaped bags, associated in groups of hundreds, and leading off by short tubes, which are interlaced in a screw-like manner, and open in all the spinnerets. 2. Six long twisted tubes, which gradually enlarge into as many pouches, and then are each protracted into a very long duct which forms a double loop. 3. Three pairs of glandular tubes, similar to the preceding, but which open externally through short ducts. 4. Two groups of much branched sacs, whose long ducts run to the upper pair of spinnerets. 5. Two slightly branched blind-tubes, which terminate by two short ducts in the middle pair of spinnerets.

"It is not easy to examine the spinnerets with a microscope, so as to make out their structure. If we confine the spider in a glass cell, it is so restless that the least shock or change of position will cause it to move to and fro; and, besides, when it does become quiescent, the spinnerets are closed in towards each other, so that we cannot see their extremities. By selecting a specimen, however, recently killed, such as this *Clubiona*, we may discern sufficient to enable us to comprehend their construction.

"Looking, then, at the abdomen from beneath, we see the three pairs of spinnerets clustered together close to the extremity. The pair most forward are shaped somewhat like barrels, whose free ends bend over towards each other. They are covered with stiff black hairs, and just within the margin of what may be called the *head* of the barrel (for it is cut off horizontally, with a sharp rim) there is a circle of very close-set, stiff, whitish bristles, which arch inwards. The whole flat surface of the 'head,' within this circle of bristles, is beset with very minute horny tubes, standing erect, which are the outlets of the silk-ducts, that belong to this pair.

"Behind this first pair are seen the middle pair, almost concealed, however, from their shortness and smallness, and from the approximation of the first and third pairs. We can discern that they are more teat-like than the preceding, terminating in a minute wart, which is prolonged into a horny tube. The whole teat is set with similar tubes, which are larger and longer than those of the first pair. Finally, the third pair resemble palpi, for each consists of two lengthened joints and they are bluntly pointed. The spinning tubes in these are limited, as it appears to me, to one or two at the extreme end of each spinneret, the whole surface besides being covered with the ordinary long bristles. Strictly speaking, however, they are three-jointed, for all the spinnerets spring from wart-like sockets, which may be considered as basal joints; and as the circlet of bristles in the first pair doubtless indicated a short joint, sunken as it were within the preceding, this pair is likewise three-jointed; the middle pair appears to be but two-jointed.

"The minute horny tubes are themselves composed of two joints, the basal one thick, the terminal one very slender, and perforated with an orifice of excessive tenuity; through which the gum oozes at the will of the animal, as an equally attenuated thread. On our *Clubiona,* the number of tubes in all the spinnerets is about three hundred; but in the Garden Spider *(Epeira)* they exceed a thousand.

"This remarkable multiplicity of the strands with which the apparently simple and certainly slender thread of the Spider is composed, has attracted the attention of those philosophers who seek to discover the reasons of the phenomena they see in nature. The explanation was first suggested, I believe, by Mr. Rennie,[1] but it has been amplified with much force by Professor Jones, in the following words:

"'A very obvious reflection will here naturally suggest itself, in connexion with this beautiful machinery; why, in the case of the Spider, it has been found necessary to provide a rope of such complex structure, when in so many Insects a simple, undivided thread, drawn from the orifice of a single tube, like the thread of the Silkworm, for instance, was sufficient for all required purposes. And here, as in every other case, it will be found, on consideration, that a complicated apparatus has been substituted for a simple one only to meet the requirements of strict necessity. The slow-moving Caterpillar, as it leisurely produces its silken cord, gives time enough for the fluid of which it is formed to harden by degrees into a tenacious filament, and it is allowed to issue by instalments from the end of the labial pipe; but the habits of the Spider require a different mode of proceeding, as its line must be instantly converted from a fluid into a strong rope or it would be of no use for the purposes it is intended to fulfil. Let a fly, for example, become entangled in the meshes of a Spider's web no time is to be lost; the struggling victim, by every effort to escape, is tearing the meshes that entangle it, and would soon succeed in breaking loose did not its lurking destroyer at once rush out to complete the cap-

[1] *Insect Architecture,* 337.

ture and save its net, spun with so much labor, from ruin. With the rapidity of thought, it darts upon its prey, and before the eye of the spectator can comprehend the manœuvre, the poor fly is swathed in silken bands, until it is as incapable of moving as an Egyptian mummy. To allow the Spider to perform such a feat as this, its thread must evidently be instantaneously placed at its disposal, which would have been impossible had it been a single cord, but being subdivided into numerous filaments, so attenuated as we have seen them to be, there is no time lost in the drying; and from being fluid they are at once converted into a solid rope, ready for immediate service."[1]

"No doubt you have often admired the exquisite regularity of those Spiders' webs which are called geometrical; that of our abundant Garden Spider, for instance. You have observed the cables which stretch from wall to wall, or from bush to bush, in various directions, to form the scaffolding, on which the net is afterwards to be woven; then you have marked the straight lines, like the spokes of a wheel, that radiate from the centre to various points of these outward cables, and finally the spiral thread that circles again and again round the radii, till an exquisite net of many meshes is formed.

"But possibly you are not aware that these lines are formed of two quite distinct sorts of silk. It has been shown that the cables and radii are perfectly unadhesive, while the concentric or spiral circles are extremely viscid. Now the microscope, or a powerful lens, will reveal the cause of this difference; the threads of the cables and radii are perfectly simple, while the spiral threads are closely studded with minute globules of fluid, like drops of dew, which, from the

[1] *Nat. Hist. of Anim. II,* 339.

elasticity of the thread, are easily separated from each other. These are globules of viscid gum, as is easily proved by touching one or two with the finger, to which they will instantly adhere; or by throwing a little fine dust over the net, when the spirals will be found clogged with dirt, while the radii and cables remain unsoiled. It is these viscid threads alone that have the power of detaining the vagrant flies which accidentally touch the net.

"The diversity of the secreting organs already alluded to, as well as in the spinnerets, is no doubt connected with this difference in the character of the silk; and it is worthy of remark that this diversity is greatest in such Spiders, as the *Epeiræ,* which spin geometric nets.

"Immense is the number of globules of viscidity that stud the spiral circles of these nets. Mr. Blackwall, the able and learned historian of the tribe, has estimated that as many as 87,360 such pearly drops occurred in a net of average dimensions, and 120,000 in a net of fourteen or sixteen inches diameter; and yet a Spider will construct such a net, if uninterrupted, in less than three-quarters of an hour."

Man has never yet discovered how to manufacture silk nets by gluing the cross-threads to the longitudinal threads. In order to do it practically, he must have a better glue than any now at his command. If the spider could speak, she could not tell him how to prepare it, for she does not know. Only the engineer who constructed her factories is in possession of the secret.

It will be noticed that the glue which is to fasten the concentric cords to the radial cords of the net is supplied to the concentric cords in minute globures separated from each other by short spaces. It must, therefore, be elaborated by a set of glands entirely distinct from those which supply the materials for the cords themselves—glands created for the special purpose of making this particular kind of glue, and provided with some unknown and unprecedented mechanism for spacing the globules properly apart. Think of it!—mechanism for forming the strong cables that constitute the spokes or radii of the net—other mechanism for constructing the lighter cords that bridge the spaces between the radii—a new method of securing the cords and radii firmly together at their crossings—a new material for such fastenings—and a machine specially invented and constructed for making and applying this new material! Can the history of man's inventions furnish a parallel to this!

But, after the net has been constructed, the little animal has to travel over it frequently, and sometimes in a great hurry to secure a fly or escape an enemy. It is necessary that she be very sure-footed, for the cables and cords are "as slender as a spider's web," and she might lose her prey or her life if she should make a misstep. Some benevolent power has foreseen this, and carefully provided against it. I quote once more from Mr. Gosse:

"Scarcely less admirable is the ease and precision with which the little architect traverses her perpendicular or diagonal web of rope; a skill which leaves that of the mariner who leaps from shroud to backstay in a ship's rigging immeasurably behind. To understand it, however, in some measure, look at this last joint of one of the feet of our well-used *Clubiona.* It is a cylindrical rod, ending in a rounded point; every part of its surface is studded with stiff, rather long, horny bristles, which, springing from the side arch inward towards the point. Now this array of spines effectually prevents a false step, for if any part of the leg, which is sufficiently long, only strikes the thread, the latter is certain to slip in between the bristles, and thus to catch the leg. But more precision than this is requisite; especially when we observe with what delicacy of touch the hinder feet are often used to guide the thread as it issues from the spinnerets, and particularly with what lightning-like rapidity the larger net-weavers will, with the assistance of these feet, roll a dense web of silk around the body of a helpless fly, swathing it up, like an Egyptian mummy, in many folds of cloth, in an instant.

"Look, then, at the extreme tip of the ultimate joint. Two stout hooked claws of dark horny texture are seen proceeding from it side by side, and a third of smaller size, and more delicate in appearance, is placed between them, and on a lower level. The former have their under or concave surface set with teeth (eighteen on each in this example), very regularly cut, like those of a comb, which are minute at the commencement of the series near the base of the claw, and gradually increase in length to the tip. These are doubtless sensible organs of touch, feeling and catching the thread; and they, moreover, act as combs, cleansing their limbs, and probably their webs, from the particles of dust and other extraneous matter which are continually cleaving to them."

Many spiders are further provided with two formidable weapons of attack. They consist of curved sharp-pointed piercing instruments perforated from their tip to their base, and each hinged to the front end of a relatively stout organ that projects forward from the spider's head. A duct extends from the instrument back into the organ to which it is hinged, and there connects to a poison-apparatus similar in form to that of the rattlesnake and the cobra. The front end of the organ which thus supports the piercing-blade is furrowed laterally from the hinge; and the blade, when not in use, shuts into the furrow just as the blade of a pocket-knife shuts into its handle. When needed for use, the animal can open the blade at will, much more quickly and conveniently than the boy can open his jack-knife. No doubt the jack-knife was considered an ingenious invention when it was first made; but the spider was in possession of it long before man. His two poison-bearing jack-knives are not connected with the mouth, as are the serpent's fangs, but are independent instruments, arranged at the points where an insect's antennæ or "feelers" are usually arranged. The chemical-factories of the spider, in their internal construction, differ as greatly from those of the snake as does a soap-factory from a sugar-refinery; for those of the spider produce an acid, whereas those of the snake produce an alkaline product—each deadly, but radically different materials. It is worthy of note that, in both classes of animals, the poison, when once in the bag, can escape only through the duct, and at the animal's will; so that there is no danger of its injuring its proprietor.

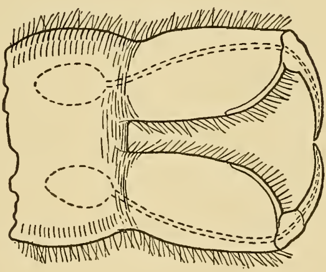

Fig. 1. Top view of spider's poison-apparatus, greatly magnified. Hinged fangs on the right. Venom-bags and ducts shown by dotted lines.

While we are on the subject of chemical-factories combined with mechanical instrumentalities in coöperative association with them, and therefore furnishing most decisive evidence of intelligent contrivance or invention, I will call attention to another class of animals in whose possession are found weapons of attack and defense having a general likeness to those of the snakes and spiders, but with significant differences of construction and arrangement, suited to the animal's different nature and necessities. Bees are accustomed to search for their food by crawling, head foremost, into the recesses of honey-bearing flowers, and thus, while pursuing their peaceful and honorable business, are exposed to injuries from behind. Accordingly, nature arranged their defensive armament to repel assaults from the rear; reminding us of the stories we used to read, in our boyhood days, about rich merchant-vessels, armed with "stern-chasers," and ready to deal death and destruction to the dreaded pirates closing upon them in the exciting chase. The bee's weapon is in the nature of a lance, which it can thrust backwards against the foe, to compel him to keep at a respectful distance; and, to render the instrument more effective and respect-inspiring, it is perforated longitudinally and connected to a poison bag containing a poison which is painful and ordinarily not dangerous to man. I have had great respect for the bee ever since I was a boy. Bees, however, never assail man, except when injured or apprehensive of injury. Hornets and wasps, armed with the same weapons, are more nervous and irritable than bees, and are generally avoided by those who are so unfortunate as to have had business relations with them.

Now, if the several forms of apparatus found in the possession of the serpents, the spiders, and the bees, wasps and hornets, do not prove the existence of mind in its author, then the magazine rifle, the Maxim gun, and the spinning-jenny, do not prove the existence of mind in their several inventors. The problems to be solved were far more difficult in the former than in the latter, and were solved by far more wonderful and perfect contrivances.

It may be well to pause here for a few moments, and consider how Evolution, as explained by Darwin and his great apostles, Huxley, Haeckel and Spencer, would be obliged to proceed in order to account for the existence of the mechanisms of the serpent, the spider, and the bees, wasps and hornets, just described. I will select the rattlesnake's mechanism as typical of the offensive and defensive devices of the animals referred to.

To produce the rattlesnake's mechanism in accordance with the Theory of Evolution, the process would necessarily be as follows: If there were no pre-existing bag and gland in the snake's head to begin with, that fact would end the matter at the outset; for Darwin's theory does not pretend to account for the creation of new organs, but only for the modification of old ones. One of its most fundamental postulates is, that *"natura non facit saltum,"*[1] but brings new forms into existence by gradually altering antecedent forms. Hence, self-styled evolutionists assume that the poison-gland and bag represent the old salivary gland and duct, altered in character and function by nature's method of slow variation. If it were known that snakes had a salivary gland and duct before they had a poison gland and bag, there would be some plausibility in the evolutionary hypothesis; but nothing is known about the primitive snakes, except that their fossilized skeletons first appear among the deposits of the Eocene period, millions of years ago, and that they were then destitute of fangs—from which fact it is inferred that they were non-poisonous. Glands and ducts, being soft, fleshy parts, decay too quickly to become fossilized; so that the world will never know whether the early snakes had salivary glands and ducts or not. The assumption that the snake's poison-gland

[1] Nature does not make a jump.

is a modified salivary gland must, therefore, be rejected a unscientific and unwarranted.

But, even if we should provisionally accept it as possibl true, it would not account for the fang, nor for the longi tudinal perforation of the fang. The evidence now of recor gives no warrant for assuming that these, or either of them existed prior to the poison apparatus, but only for the con trary. Besides, salivary glands do not discharge their saliv through perforated fangs, nor through perforated teeth. Bu here, the so-called evolutionist, having already made one un warrantable assumption, now proceeds to make anothe namely, that the fang is merely a modified tooth, and th longitudinal perforation merely a modification in the struc ture of that particular tooth. And thus we are led from as sumption to assumption, from guess to guess, without an evidence whatever upon which to base these guesses. Let u examine them, *seriatim,* to see whether an argument supporte by them alone deserves the acceptance of thinking men. Th *first* guess is, as we have seen, that there pre-existed in th snake's head a gland for secreting a digestive fluid, and duct for conveying that fluid from the gland to the mouth the *second* guess is, that, for some unaccountable reason, o for no reason at all, nature, having produced these gland (which have always worked well in other animals), becam dissatisfied with them in the snake's head, and proceeded t vary their construction so that they should henceforth pro duce a poison instead of a digestive fluid; and left the un fortunate snake to get along as well as he could without h accustomed saliva; the *third* guess is, that she then went t work upon the ducts which had conveyed the saliva freel from the glands to the mouth, and transformed them int *bags* which should hold the poison, not allowing it to ente the mouth; the *fourth* guess is, that she then altered th arrangement of the teeth of the upper jaw, moving the two front ones out of line with the others, so as to bring them at the outer edge of the jaw; the *fifth* guess is, that, having got these two teeth at the outer edge of the jaw, so that they should not interfere with the closing of the jaws together, she developed them into long, sharp-pointed fangs totally unlike the other teeth; the *sixth* guess is, that she then bored a small hole through each of them, from the apex to the base; the *seventh* guess is, that she extended the mouth of the two bags to the bases of the fangs, and connected them to the perforations which she had made; the *eighth* guess is, that she built up strong muscles around the bag, and placed them under command of the snake's will, so that by contracting them, he could squirt the poison through the fangs whenever inclined to do so; the *ninth* guess is, that, in the rattlesnake, she became dissatisfied with the operation of the fangs, and hinged them to the jaw so that they could be turned upward and downward on the hinge as a pivot; and the *tenth* guess is, that, having hinged the fangs to the jaw, she constructed and arranged muscles for the special purpose of turning the fangs up and down at will, and nerves to control the muscles. There were no such muscles or nerves before the hinge appeared—how came they to be formed when, or after, the hinge was formed?

Now this is a pretty formidable array of conjectures upon which to build a "scientific" theory! And yet, all of them are necessary—none can be spared without destroying the theory. What do you think of it—do you call it science or guess-work?

Let us apply the same reasoning to the case of the spider, and see what will come of it—surely, if it is competent to explain the origin of the snake's poison-apparatus, it ought to prove equally competent to account for that of the spider, so very similar to the snake's. But strange to say, it utterly fails when we attempt to apply it to the spider; for we find that the spider had no salivary gland to start with, no teeth to be altered into fangs, and no jaws. We are then at a loss to know how to proceed; but the pseudo-scientist is not—he immediately gives birth to another and different theory, to account for the spider's apparatus—he observes that other insects (not spiders) have antennæ or "feelers," growing out of their faces at about the same place where the spider's fangs are found. That is enough for him—he forthwith proceeds to *assume* again. This time, he assumes that the fangs and poison-bags are modified *antennæ!* He does not even attempt to account for the jack-knife arrangement by which the spider shuts up his fangs out of the way when not in use.

Well, then, let us try the "snake-theory" on the bee, and see how it works there. At last, our pseudo-scientist is nonplussed. For the poison-apparatus is located in the gable-end of the bee, where there is neither salivary gland, nor fangs, nor antennæ, nor anything else to modify; but the bee's poison-apparatus is even neater and more perfect than those of the snakes and spiders, and works just as well. Moreover, the exercise of intelligence is clearly discernible in locating it at that part of the bee's body which is exposed to assault while his head and legs are hidden in the recesses where he is obliged to search for his food and building-materials.

In view of the total failure of Darwin's theory to give any reasonable or even plausible explanation of the origin of the poison-apparatus, it is hopeless to ask it to explain the origin of the spider's spinning-mill. The questions: whence came knowledge of the chemical composition employed as a material from which to form the strands; or knowledge how to construct a gland to make that composition; or knowledge of the practical advantages of constructing the cords and cables from a large number of strands; or, when constructing the glands, the prevision to foresee that there will have to be two kinds of cords, one for the cables and radii and another and different one for the concentric connecting-cords; or the prevision to foresee that the connecting-cords and radii will have to be fastened together at the points where they cross; or the inventive wit to conceive of fastening them together with glue; or knowledge how to construct the machinery for spacing the glue; are entirely beyond the power of Evolution to answer. Even man, today, with his almost infinite intelligence, can claim only to know the advantages of constructing the cords and cables from a large number of separate strands, as he constructs the cables of suspension-bridges, and of fastening the intersecting cords and cables together where they cross each other, and as he fastens the intersecting strands of his fish-nets. The other questions can be answered only by the infinite Mind which the theist intelligently worships under the name of God, and the atheistic materialist unwittingly worships under the name of Nature. I will not ask Evolution to explain the self-evident proofs of design in the structures hereinabove referred to; she would indignantly reply that she has nothing to do with design, except to expurgate the false evidence from the true, and that she leaves to the theologian all questions of that nature.

We see, by this time, that Evolution has its limitations—it cannot account for everything, nor the half of everything. It can explain the gradual alteration of a foot into a hand, of a fin into a wing (although not without much *assuming*), and of a soft paw into a hoof; but there must always be some antecedent thing to start with; evolution never *creates,* but only *modifies.*

2.—As we have seen, the snakes, spiders and bees are provided with poison-factories, poison-receptacles, sharp instruments for making a wound, and means for shooting the poisonous liquid into the wound; and the construction and combination of these instrumentalities are essentially the same in them all. But the animals thus armed are not the same, nor even in any way related to each other. Snake, spider and bee must, therefore, have obtained their armament independently of each other; for there was no common ancestor from whom to inherit it. From whom could they have obtained the general plan of the apparatus, if not from the Author of Nature? Who but He was competent to originate the plan, or had the power to put it in operation simultaneously in animal structures so radically different as those of snakes, spiders, and bees? No hypothesis of fortuitous "variations" can account for its origin in all three of these classes of animals; no doctrine of "heredity" can explain it, either on the Darwinian hypothesis of "pangenesis" or the Mendelian hypothesis of "mutations;" no theory of "natural selection" can tell us why it did not result in the extermination, rather than the survival, of the ratlesnake.

3.—Thus, whatever may have caused the origin of this particular apparatus in these three classes of animals, it is clear that "evolution" sheds no light upon the subject. Something deeper and more far-reaching than evolution was involved in it. If that something, in embodying its conception, did not find any pre-existing structure to modify, it could *create.* If teeth were not there to make use of, it could use antennæ equally well; if neither teeth nor antennæ were available, it could get along without them; if the animal's head were, in consequence of its position, not adapted to render the use of the new poison-apparatus serviceable, it could take the animal's tail. All things were alike at its command.

CHAPTER VI.

The Eye.

Let us select the human eye as our next example—not because it displays greater inventive intelligence, ingenuity and skill than the other examples which are to follow (for it does not), but because in its scientific principle it closely parallels one of man's inventions, the refracting telescope, so that the latter can be used as a standard by which to estimate the degree of inventive skill manifested in the eye, and because it is familiar to everybody, and is situated conveniently for purposes of examination and comparison.

The refracting telescope utilizes the scientific principle or fact that a ray of light, passing through a transparent thin medium such as air, and then striking at an angle the surface of a denser transparent medium, for example, water or glass, is refracted or bent out of its course by the surface of the denser medium, to an extent proportionate to the angle of incidence. To utilize that principle, the refracting telescope is constituted to receive upon a large circular glass surface (the "object-glass") the rays of light coming through the air, and to bend towards a pre-determined point (the focal point) such of them as otherwise would not strike that point. This is accomplished by making the surface of the glass increasingly convex or lenticular, so that the rays will be concentrated on the focal point. The distance of the focal point from the centre of the glass lens is inversely proportionate, of course, to the convexity of the lens. The rays of light, thus concentrated, are to pass through the pupil of the observer's eye and fall upon the retina; and, as it would be difficult for him to hold his eye in such a position that the retina would come exactly at the focal point of the telescope, the latter is provided with a small lens (the "eye-piece"), arranged slightly forward of the focal point, and adapted to refract the converging lines into parallel lines from the eye-piece backwards toward the eye. The object-glass, especially near its periphery, would, by its increasing convexity, be liable to decompose and color the light, as in certain opera-glasses, were not some means employed to counteract the tendency. Therefore, to render the telescope achromatic, the lens is made by a combination of two substances such as crown and flint glass, having dissimilar refractive powers, arranging them so that the colored or chromatic aberration of light passing through a single lens is corrected, and the light passes undecomposed and therefore colorless. The object-glass and eye-piece are supported in a tube, which excludes all light-rays except those coming from the object to be observed or its immediate vicinity. The structure demonstrates both the inventive ability of its author and his profound knowledge of the laws of light.

But the human eye exhibits incomparably greater inventive ability and constructive skill than the telescope. The principal part (speaking quantitatively) is a compound lens, operating on the same general principle as that of the telescope, and enclosed within the contour of the eye formed by the cornea, sclerotic coat, and choroid. Of the three members composing the compound lens, one, the aqueous humor, a thin watery fluid, is arranged immediately back of the transparent cornea; the next, the crystalline lens, a transparent lenticular body, is arranged behind the aqueous humor; and the third, the vitreous humor, a transparent jelly-like substance, occupies the entire space behind the crystalline lens.

The iris, a beautifully-colored elastic curtain, having a circular central aperture called the pupil, is suspended between the aqueous humor and the crystalline lens by means of muscles which are capable of automatically contracting and relaxing to adjust the size of the pupil to the intensity of the light. The front end of the optic nerve is spread out, like the frayed end of a string, over the rear inner wall of the eye-

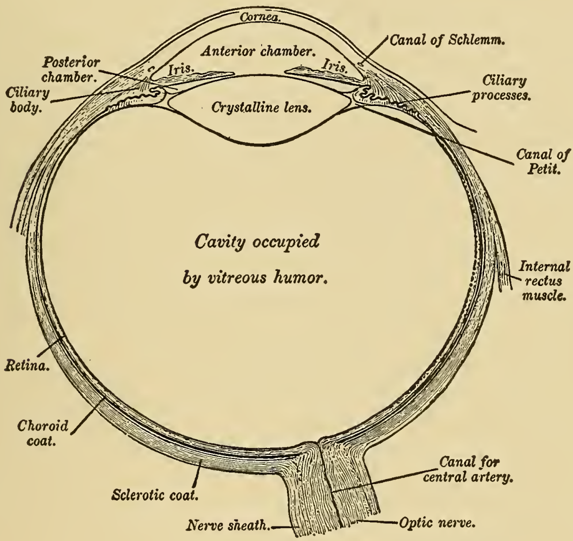

Fig. 2. Section through the eye, magnified.

ball, forming a network called the retina, exceedingly sensitive to the action of light.

Paley, in Chapter III of his "Natural Theology," tells the story of the human eye with such admirable clearness that I take the liberty of borrowing a portion of his description. He says:

"The difference between an animal and an automatic statue consists in this,—that, in the animal, we trace the mechanism to a certain point, and then we are stopped; either the mechanism becoming too subtle for our discernment, or something else beside the known laws of mechanism taking place: whereas, in the automaton, for the comparatively few motions of which it is capable, we trace the mechanism throughout. But, up to the limit, the reasoning is as clear and certain in the one case as in the other. In the example before us, it is a matter of certainly, because it is a matter which experience and observation demonstrate, that the formation of an image at the bottom of the eye is necessary to perfect vision. The image itself can be shown. Whatever affects the distinctness of the image affects the distinctness of vision. The formation then of such an image being necessary (no matter how) to the sense of sight, and to the exercise of that sense, the apparatus by which it is formed is constructed and put together, not only with infinitely more art, but upon the self-same principles of art as in the telescope or the camera obscura. The perception arising from the image may be laid out of the question; for the production of the image, these are instruments of the same kind. The end is the same, the means are the same. The purpose in both is alike; the contrivance for accomplishing that purpose is in both alike. The lenses of the telescope, and the humors of the eye, bear a resemblance to one another, in their figure, their position, and in their power over the rays of light, viz.: in bringing each pencil to a point at the right distance from the lens; namely, in the eye, at the exact place where the membrane is spread to receive it. How is it possible, under circumstances of such close affinity, and under the operation of equal evidence, to exclude contrivance from the one; yet acknowledge the proof of contrivance having been employed, as the plainest and clearest of all propositions, in the other?

"The resemblance between the two cases is still more accurate, and obtains in more points than we have yet represented, or than we are, on the first view of the subject, aware of. In dioptric telescopes there is an imperfection of this nature. Pencils of light, in passing through glass lenses, are separated into different colors, thereby tinging the object, especially the edges of it, as if it were viewed through a prism. To correct this inconvenience had been long a desideratum in the art. At last it came to the mind of a sagacious optician to inquire how this matter was managed in the eye; in which there was exactly the same difficulty to contend with as in the telescope. His observation taught him that in the eye the evil was cured by combining lenses composed of different substances, i. e., of substances which possessed different refracting powers. Our artist borrowed thence his hint, and produced a correction of the defect by imitating, in glasses made from different materials, the effects of the different humors through which the rays of light pass before they reach the bottom of the eye. Could this be in the eye without purpose, which suggested to the optician the only effectual means of attaining that purpose?[1]

"But, further, there are other points not so much, perhaps, of strict resemblance between the two, as of superiority of the eye over the telescope, yet of a superiority which, be-

[1] Paley was quite right in stating that Dollond corrected chromatic aberration in the telescope by the combination in the lens of two sorts of glass having different refractive and dispersive powers; also in stating that this important discovery in physics was suggested by careful study of the eye. But he is now believed to have been wrong in intimating that the eye is absolutely free from chromatic aberration. Its aberration is so slight, however, as not to interfere at all with ordinary vision and not to be detected except by careful experiment.

ing founded in the laws that regulate both, may furnish topics of fair and just comparison. Two things were wanted to the eye which were not wanted (at least in the same degree) to the telescope; and these were the adaptation of the organ; first, to different degrees of light; and secondly, to the vast diversity of distance at which objects are viewed by the naked eye, viz., from a few inches to as many miles. These difficulties present not themselves to the maker of the telescope. He wants all the light he can get, and he never dircts his instruments to objects near at hand. In the eye, both of these cases were to be provided for; and for the purpose of providing for them a subtle and appropriate mechanism is introduced.

"I. In order to exclude excess of light, when it is excessive, and to render objects visible under obscurer degrees of it, when no more can be had, the hole or aperture in the eye, through which the light enters, is so formed as to contract or dilate itself for the purpose of admitting a greater or less number of rays at the same time. The chamber of the eye is a camera obscura which, when the light is too small, can enlarge its opening; when too strong, can again contract it; and that without any other assistance than that of its own exquisite machinery. It is self-adjusting in the following way:—The impression which a varying degree of intensity of light makes on the retina, is conveyed to the brain by the nerve of vision; and thence, as a consequence of this stimulus, a reflex current of nerve force is emitted, and conveyed by appropriate nerve-fibres to the muscular ring or iris, which, by its action, can either contract or expand the pupil. It is further, also, in the human subject to be observed, that this hole in the eye, which we call the pupil, under all its different dimensions, retains its exact circular shape. This is a structure extremely artificial. Let an artist only try to execute the same; he will find that his threads and strings must be disposed with great consideration and contrivance to make a circle which shall continually change its diameter, yet preserve its form. This is done in the eye by an application of fibres, i. e., of contractile strings, similar in their position and action to what an artist would endeavor to procure, and must employ if he had the same piece of workmanship to perform.

"II. The second difficulty which has been stated was the suiting of the same organ to the perception of objects that lie near at hand, within a few inches, we will suppose, of the

Fig. 3. Front view of the eye showing the pupil and the regulating fibres around it.

eye, and of objects which are placed at a considerable distance from it, that, for example, of as many furlongs (I speak in both cases of the distance at which distinct vision can be exercised). Now this, according to the principles of optics, that is, according to the laws by which the transmission of light is regulated (and these laws are fixed), could not be done without the organ itself undergoing an alteration, and receiving an adjustment, that might correspond with the exigency of the case, that is to say, with the different inclination to one another under which the rays of light reached it. Rays issuing from points placed at a small distance from the eye, and which consequently must enter the eye in a spreading or diverging order, cannot, by the same optical instrument in the same state, be brought to a point, i. e., be made to form an image in the same place, with rays proceeding from objects situated at a much greater distance, and which rays arrive at the eye in directions nearly (and physically speaking) parallel. It requires a rounder lens to do it. The point of concourse behind the lens must fall critically upon the retina, or the vision is confused; yet, other things remaining the same, this point, by the immutable properties of light, is carried further back when the rays proceed from a near object, than when they are sent from one that is remote. A person who was using an optical instrument would manage this matter by changing, as the occasion required, his lens or his telescope, or by adjusting the distance of his glasses with his hand or his screw; but how is it to be managed in the eye? What the alteration was, or in what part of the eye it took place, or by what means it was effected (for if the known laws which govern the refraction of light be maintained, some alteration in the state of the organ there must be), has long formed a subject of inquiry and conjecture. The change, though sufficient for the purpose, is so minute as to elude ordinary observation. The adjustment to distance is most likely dependent on the varying convexity of the lens, which is determined by the pressure to which it is subjected, through the indirect agency of a special muscular contrivance. These changes in the eye vary its power over the rays of light in such a manner and degree as to produce exactly the effect which is wanted, viz., the formation of an image *upon the retina,* whether the rays come to the eye in a state of divergency, which is the case when the object is near to the eye, or come parallel to one another, which is the case when the object is placed at a distance. Can anything be more decisive of contrivance than this? The most secret laws of optics must have been known to the author of a structure endowed with such a capacity of change. It is as though an optician, when he had a nearer object to view, should *rectify* his instrument by putting in another glass, at the same time drawing out also his tube to a different length.

"Observe a new-born child first lifting up its eyelids. What does the opening of the curtain discover? The anterior part of two pellucid globes, which, when they come to be examined, are found to be constructed upon strictly optical principles; the self-same principles upon which we ourselves construct optical instruments. We find them perfect for the purpose of forming an image by refraction, composed of parts executing different offices; one part having fulfilled its office upon the pencil of light, delivering it over to the action of another part; that to a third, and so onward: the progressive action depending for its success upon the nicest and minutest adjustment of the parts concerned; yet, these parts so in fact adjusted as to produce, not by a simple action or effect, but by a combination of actions and effects, the result which is ultimately wanted. And forasmuch as this organ would have to operate under different circumstances, with strong degrees of light, and with weak degrees, upon near objects, and upon remote ones, these differences demanded, according to the laws by which the transmission of light is regulated, a corresponding diversity of structure; that the aperture, for example, through which the light passes, should be larger or less; the lenses rounder or flatter, or that their distance from the tablet, upon which the picture is delineated, should be shortened or lengthened: this, I say, being the case, and the difficulty to which the eye was to be adapted, we find its several parts capable of being occasionally changed, and a most artificial apparatus provided to produce that change. This is far beyond the common regulator of a watch, which requires the touch of a foreign hand to set it; but it is not altogether unlike Harrison's contrivance for making a watch regulate itself, by inserting within it a machinery, which, by the artful use of the different expansion of metals, preserves the equability of the motion under all the various temperatures of heat and cold in which the instrument may happen to be placed. The ingenuity of this last contrivance has been justly praised. Shall, therefore, a structure which differs from it chiefly by surpassing it, be accounted no contrivance at all? or, if it be a contrivance, that it is without a contriver!

"Sturmius held, that the examination of the eye was a cure for atheism. Beside that conformity to optical principles which its internal constitution displays, and which alone amounts to a manifestation of intelligence having been exerted in the structure; besides this, which forms, no doubt, the leading character of the organ, there is to be seen, in everything belonging to it and about it, an extraordinary degree of care, an anxiety for its preservation, due, if we may so speak, to its value and its tenderness. It is lodged in a strong, deep, bony socket, composed by the junction of seven different bones, hollowed out at their edges. . . . Within this socket it is embedded in fat, of all animal substances the best adapted both to its repose and motion. It is sheltered by the eye-brows; an arch of hair, which, like a thatched penthouse, prevents the sweat and moisture of the forehead from running down into it.

"But it is still better protected by its *lid*. Of the superficial parts of the animal frame, I know none which, in its office and structure, is better deserving of attention than the eye-lid. It defends the eye; it wipes it; it closes it in sleep; and its delicate texture is never encumbered with fat."

This lid operates both automatically and at will. If when the light is very intense, the iris does not shut it off sufficiently, you partially close the lid, or, without waiting for your orders, it partially closes itself, thereby co-acting with the iris to protect the retina. Thus the retina is doubly guarded by automatic arrangements, and one of these arrangements acts both automatically and at will to protect the whole surface of the eye from injury or annoyance.

Paley proceeds to say:

"Are there in any work of art whatever, purposes more evident than those which this organ fulfills? or an apparatus for executing those purposes more intelligible, more appropriate, or more mechanical? If it be overlooked by the observer of nature, it can only be because it is obvious and familiar. This is a tendency to be guarded against. We pass by the plainest instances, whilst we are exploring those which are rare and curious; by which conduct of the understanding, we sometimes neglect the strongest observations, being taken up with others, which, though more recondite and scientific, are, as solid arguments, entitled to much less consideration.

"In order to keep the eye moist and clean (which qualities are necessary to its brightness and its use), a wash is constantly supplied by a secretion for the purpose; and the superfluous brine is conveyed to the nose through a perforation in the bone as large as a goose-quill, or, more properly speaking, along two capillary tubes, one from either eyelid, which enter a duct, lodged in a canal passing through the bone. When once the fluid has entered the nose, it spreads itself upon the inside of the nostril, and is evaporated by the current of warm air, which, in the course of respiration, is continually passing over it. Can any pipe, or outlet, for carrying off the waste liquor from a dye-house or a distillery, be more mechanical than this is? It is easily perceived that the eye must want moisture: but could the want of the eye generate the gland which produces the tear, or bore the hole by which it is discharged—a hole through a bone?"

And, as if for a final precaution to protect man and other animals against the loss of their sight, the eye is *duplicated,* so that should one eye be accidentally destroyed, another will, in the great majority of cases, be left for use.[1]

With regard to the origin of the organs of sight, naturalists generally concur in the opinion that, in the most primitive forms of animal life, the entire body is more or less sensitive to light and sound and that, by reason of this sensitiveness, the little animal probably has a dim and indistinct sense of the proximity of other physical bodies, especially such as are capable of motion. Their theory is that this sense gradually became localized, and the localized spots developed into separate organs of sight and hearing; the former, under the influence of light waves, and the latter, under the influence of sound waves, and that, at first those organs were rude and imperfect, but afterwards developed into the existing forms. All this accords with Darwin's theory, and may possibly be true. There are, moreover, in or about the eye, several peculiar constructions or arrangements, cited by Paley as evidences of creative design rather by reason of their obvious utility to the animal than by reason of any inherent proofs of intelligent contrivance, and which therefore may reasonably be considered as due to evolution, or even to chance coincidence. The location of man's eyes in the two

[1] This duplication of organs, in the animal body, is a very remarkable and significant phenomenon, resulting from a cause as deeply hidden as the very foundations of animal life, and indicating the control of a higher power over the laws of evolution.

recesses or angles formed by the junction of the ciliary and nasal ridges—an arrangement which protects them quite effectively from accidental injury; and the arrangement of the lashes and eyebrows; while consistent with the theory of design, are by no means to be regarded as proofs of it. But, on the other hand, the construction of the compound lens, which indicated to Dollond exactly how to remedy a serious defect in the telescope, up to that time considered as incurable; the iris, which protects the retina from injury, and automatically regulates the light to the requirements of its sensitive nerve-substance; the tear-glands, their overflow-ducts and the holes formed in the nasal bones to allow the ducts to pass through and discharge the overflow to the place where it is needed to keep the mucous membrane of the nose in healthy condition; and the mechanism by which the eye automatically adjusts itself to objects at different distances: are things that no reasoning mind can refer to evolution, or conceive of as due to chance and coincidence. It is impossible to exaggerate the inventive ingenuity displayed in the wonderful self-adjusting eye-curtain. If either of the two inventions last referred to had been made by a man, it would have immortalized his name. Watt, in the automatic governor by which a steam-engine regulates its own supply of steam, and Weston, in the process by which a current of electricity traversing an incandescent-lamp filament regulates the electric resistance of that filament, made inventions of analogous character; and no materialistic philosopher has risen to question their inventive genius. On what principle of reason or logic is the same kind of invention a conclusive proof of contrivance when found in one place, and no proof at all when found in another? Is this the kind of reasoning to which we are treated by materialistic philosophy! If so, the less we hear of its reasoning, the greater respect we shall have for it. I can conceive of no difference in the two cases under consideration, except that one reveals the operation of an imperfect, and the other, that of a perfect mind—the one mind reaching its conclusion by a slow and wearisome process of study and labor, and the other, by the instantaneous flash of an all-seeing intelligence.

In considering the weight and probative force of the proofs cited and to be cited in this work, it must be observed and remembered that they are cumulative—they come as a multitude of unimpeachable witnesses bearing concurrent testimony to prove a single fact, the fact that the exercise of mind is manifested in the works of nature.

So far, we have considered only the human eye, which differs in important particulars from the eyes of all the lower animals. If now, we turn our attention to the entire range of the animal kingdom, we shall be amazed at the apparently unlimited variety of expedients and combinations to which the Creative Power has resorted in providing Its creatures with the means of vision. For example, in snakes, which discard their skin about once a year, like an old coat unfit for further use (after having first grown a new one underneath to take its place), the skin extends continuously over the eyes and would obstruct the vision were not some expedient adopted to obviate the difficulty. To provide for the emergency, the skin, which is elsewhere thick and colored in various designs, is created thin and transparent over the eyes so as not to interfere with their function. Here is a novel and extraordinary contrivance indeed! Whence came the chemistry that decolorized the skin exactly over the underlying eyes, and nowhere else? Who watched over the skin-forming operation and directed the chemical action to confine itself to those two particular spots? Who was it that had the intelligence to foresee that such action would be necessary there, and the power over the vital forces of the snake to compel them to set it in opration? Who knows what is the nature of the chemical action that prevents the formation of color and opacity there, and by what ingredients it produces its results? These are vital questions, to which a scientific answer is very desirable; for, until it is given, there is but one conclusion to be drawn from the known facts, namely, that the operation of nature's forces is presided over and directed by an all-seeing Intelligence that never sleeps or tires.

Let it be observed that Evolution cannot be assigned as the probable cause of the snake's skin having become transparent at the spots immediately overlying the eyes; for Evolution proceeds only by slowly modifying pre-existing conditions, and one of its fundamental principles is that if an organ in plant or animal be not exercised it degenerates rapidly and finally ceases to exist. The fishes that have found their way into underground waters and taken up their permanent residence there are found to have lost their eyes. If the first snakes had had opaque skins covering their eyes, the same misfortune would have happened to them. Besides, the snake's skin lasts only a year, and that is too brief a period to produce any novelty of structure through the slow processes of Evolution. The new skin of next year will not be the product of this year's skin, nor will they occupy the relation of parent and offspring. Thus the pre-existing condition of opacity could not have become modified by Evolution in time to save the eyes; nor is it conceivable that it could by that means have become modified at all.

The only alternative theory is that snakes always had skins provided with glazed windows to cover and protect the eyes—the first snake, as well as the last—but that assumption is fatal to the whole theory of evolution by progressive modification and the survival of the fittest, and leads us directly to a great creative Intelligence underlying and controlling all the works of nature. That that great underlying Cause is not confined to one method of creation, but sometimes produces new structures by gradually modifying old ones, and sometimes by suddenly bringing them into existence without such antecedents, cannot be successfully denied.

The human eye is normally adjusted for far sight, but its focal distance can readily be shortened by tightening up the muscles which control the convexity of the lens. It requires an appreciable time for a person to do this, as may be ascertained by experiment. But a bird can instantly adjust the focal distance of its vision in the same way. An osprey darts down hundreds of feet with unerring accuracy to seize a small fish that it sees near the surface of the water—using its far sight in spying the fish, and its near sight when seizing it. Many insects have two sets of eyes, one set for far sight and the other for near sight. Many others are provided with hundreds, or even thousands, of eyes, the house fly, for example, having 8,000, and the swift dragon-fly nearly double that number. To our vision unaided by the microscope, each of these insects appears to have only two large and bulging eyes with regularly-curved visual surfaces; but under the microscope the two large bulging eyes are shown to be compound organs of vision made up of thousands of single eyes constructed in the form of elongated tubes closed at their front end and set into the compound eye like pins in a hemispherical pin-cushion. The heads, or closed ends, of the little tubes contact with each other on every side so as to form the continuous visual surface of the compound eye, which is now seen not to be regularly curved, but composed of almost infinitesimal facets resembling the facets of a cut diamond. Each transparent facet closes the front end of one of the tubes and acts as a lens to direct the ray of light to a nerve fibril which extends from the inner end of the tube to the insect's brain. Thus each facet, tube, and nerve-fibril together constitute a separate single eye, provided with an optic nerve, and ready for business. The Austrian naturalist, Exner, has recently demonstrated that what each single eye sees is a separate portion of the field, and that these separate portions contact together to make up the whole field seen by the compound eye.

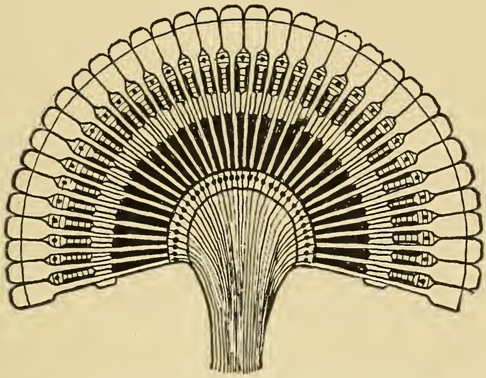

Fig. 4. Section through the eye of a dragon-fly. The stem at the bottom of the Fig. is the optic nerve, consisting of a fibril from each lens.

This is a strange and exceedingly complicated but effective contrivance for the purposes of the little insect. It apparently has no means of focal adjustment; but the creature probably needs none. The bulging compound eye sees clearly in almost every direction; as an attempt to catch its owner will readily prove. The two compound eyes are undoubtedly coördinated to act together without confusion of vision.

It is inconceivable that such an organ could have been formed without intelligent design, or by any process of blind evolution. No known law of evolution by progressive modification and survival of the fittest explains how a single eye could generate, not a modification of its *own* form or structure, but *another single eye* exactly like the first; nor how thousands of these single eyes, thus unaccountably generated, and individually capable of seeing a limited section of the entire field, could mass themselves together into a compound eye having a continuous visual surface practically curved so as to take in the whole area. We know, indeed, that the compound eye came into existence by the process of natural growth, like all other living things; but that only proves that the forces of nature, which determine the fact and direction of growth, are not acting blindly or incoherently, but, under the guidance and control of an all-seeing Intelligence, are working out forms and structures which exhibit the strongest possible evidences of design. Such a structure as the eye of a dragon-fly, with its 14,000 lenses coöperating to effect one common and useful purpose, would, if created by the hand of man, be pronounced by any court in the world to be obviously the result of intelligent contrivance; is the structure, when found in the works of nature, where no science or knowledge can prove that it was, or could be, produced without intelligent contrivance, any less conclusive? There is a limit to the claims of scepticism and unreason, beyond which they have no right to ask permission to go; and it seems to me that that limit is here reached.

Nature exhibits a wonderful variety in the form, construction, and arrangement of the eyes. In some creatures, the pupils are round, elongated, or angular. In others, there is a multiplicity of eyes, strangely and often queerly disposed, eyes surrounding the mouth for the obvious purpose of inspecting the food, eyes arranged in the top of the head, in the ends of the horns, on the tail, or at the sides of the legs, eyes with no lids or with one, two, or even three lids, eyes relatively small, eyes in the head and larger than all the rest of the head. These variations excite our curiosity and wonder, but are useless for the purposes of this discussion, and will therefore be passed without further comment.

CHAPTER VII.

The Ear.

The ear is another organ whose construction clearly manifests the exercise of creative contrivance. Moreover, it shows that its constructor possessed a perfect knowledge of the most recondite laws of mathematics, physics and mechanics. It is evident that he foresaw the vast possibilities of usefulness to the animal kingdom that lay hidden within those laws.

The ear is a most wonderful structure—an apparatus by which human society, with all that it implies, is rendered possible through the utilization of mere air-waves. Light-waves enable man to see: but sound-waves have enabled him to construct and use language, without which he could never, on this planet, have risen above the condition of a deaf, dumb and savage brute.

With the eye only, he can determine the size, shape, movement, direction and color of things; with the ear only, he can take cognizance of the sounds which they give off, and thence judge of their direction and movement. This is all they do; and yet it is to these two forms of vibration, light-waves and sound-waves, that we are indebted for all that makes life worth living. From the mere staetment of these facts, we might be led to infer that the Creative Intelligence, knowing the importance of the eye and ear to man, would be certain to confer upon them a perfection of design and construction worthy of their dignity; and our inference would apparently be justified. But the care bestowed by the same great Creator upon the humble spider's wonderful spinning apparatus, upon the planning and fashioning of the bee's defensive weapon, and upon the amazing contrivance of the dragon-fly's eye, teach us impressively that our judgment of the Creator's purposes is entitled to very little consideration.

Sound-waves differ so widely from light-waves in form, in velocity, in the medium through which they are propagated, and in the rapidity with which one wave follows another, that very different instrumentalities are necessary for their utilization by the senses. Light-waves, propagated through the ether at the velocity of 186,400 miles per second, are incapable of producing sensible vibrations of the minutest structure made by man; whilst sound-waves, propagated in air, at the velocity of eleven hundred and twenty feet per second, are capable of exerting great force and of easily producing sensible vibrations in physical structures. The eye is adapted to vibrations of the ether; the ear, to vibrations of the heavier medium, air. To that end, it is provided with a thin stretched membrane (the drum-head or ear-drum) which vibrates readily in consonance with sound-waves. The vibrations thus set up in the membrane are transmitted to the auditory nerve in a modified and greatly-reduced form, by a complex arrangement of intermediate devices (sometimes, for the sake of brevity of description, called "the internal ear") whose mechanical functions and mode of operation science has not yet been able to identify and verify,[1]

[1] It is impossible to convey a clear idea of this complicated structure either by verbal description, pictorial illustration, or both combined. The parts are small, numerous, complex, and involved, sometimes one inclosing and concealing another. Moreover, they are of many different and strangely peculiar forms, and lie in planes variously inclined to each other. The part called "the organ of Corti," for example, whose function is unknown, contains 10,000 microscopic rods, and about 15,000 hair-cells. Out of all this labyrinthian complexity, the purpose of two devices is clearly apparent, viz., the Eustachian tube, to equalize the air-pressure on both sides of the ear-drum, and the handle of the malleus, to dampen the vibrations of the ear-drum and transmit the vibratory movements to the intermediate connections which convey them to the auditory nerve.

except that they in some way transmit the vibrations to the auditory nerve, which conducts them to the brain, where the mind recognizes them as signs of events occurring at the time in the outer world, and readily learns to understand and translate their meaning.

The general plan of organization is remotely analogous to that of the variable-resistance telephone-transmitter—the analogy consisting in the fact that both employ aerial sound-waves to communicate to a diaphragm vibrations corresponding in form to those of the causative sound-waves, and also employ a conductor in the form of a wire to receive and transmit the vibrations coming to it from the diaphragm through intermediate connections. But there the resemblance ends—the telephone does not hear, but only telegraphs to the ear-drum the impulses of sound-waves that are too far away to act upon it directly. The distant sound-wave is mechanically reproduced in copy close to the ear. The ear then takes charge of the matter, and communicates it to the brain, where the mind is waiting to hear of it and to take action accordingly. The telephone is only a useful gatherer of news to the ear, which is the instrument of communication with the mind.

Unlike the telephone, the internal ear needs for its work no electro-magnet, and no battery—simple contact of the intermediate connections appears to be all that is necessary. But what an enormous expenditure of inventive contrivance was required to fit those connections for their work! We do not know why, or how it was necessary; but it evidently was. A few members of the connecting train are large enough to be visible to the naked eye when the ear-structure is dissected and examined; and, in them and the parts that coöperate with them, the evidences of contrivance and careful design can plainly be seen, and even the immediate purpose of their combination can be as plainly understood. But in the great majority of members, including the ten thousand curiously constructed rods of Corti, visible only through the microscope, and in the thousands of hair-cells, our ignorance of their purpose and action precludes the possibility of determining what proofs of creative design are exhibited in them.

A priori, the transmission of audible sound-vibrations to the brain through the mechanism of the ear would seem to require great complexity of structure and organization. The range of audible sound-vibrations extends from about 1,000 per second to 40,000 per second. The timbre or quality of the resulting sound depends upon the number and pitch of the auxiliary vibrations; and the loudness of the sound is determined by the amplitude of the vibratory movement. Think of the billions of permutations of which all these sound-elements are capable; and that the mechanism of the internal ear is able to report them all to the brain with perfect accuracy! No wonder that we find that mechanism complicated and impossible to understand! True, the telephone is able to transmute all these sound-waves into electric vibrations, and then to transmute the electric vibrations back into audible sound-waves; and the wireless-telegraph is able to transmute aerial sound-waves into etheric waves of the same "pitch," and thus to send visible Morse signals without a wire. These are wonderful inventions; but they cannot take the place, nor do the work, of the organs of sight and hearing, which contain the secret of harnessing together mind and matter. They can only bring their collection of mechanical signals to the eye or the ear, upon which alone they must rely to make it intelligible to the mind, through the coöperative action of mechanism of complex and unknown construction with special orders of brain-cells of equally unknown construction. The contrivance of such mechanism is infinitely beyond the genius of man; can it be accounted for on the theory of evolution?

Not on any theory of evolution given to us by Darwin and his followers. His theory requires antecedent structures —which it supposes to have been in the course of ages gradually modified into existing structures. But here, so far as we know, there were no antecedent structures, capable of being thus modified. His theory rejects the idea of contrivance; but here, contrivance is too strongly indicated to be summarily disposed of except by countervailing evidence of the most conclusive character—and there is no such evidence. Evolution, therefore, utterly fails to shake the conclusion that there has been manifested in the works of nature an inventive genius far transcending the genius of man.

There is another invention in the ear, which we have not yet considered. The diaphragm or tympanum is a thin and delicate membrane, liable to be bursted inwards by heavy and sudden sounds, unless some provision had been made to support it on the inner side. Such provision has been made by its inventor—an ample air-passage, extending from its inner side to the air spaces of the mouth and nose. A sound-wave thus reaches both sides of the thin membrane at substantially the same instant, and supports it in each direction against the force coming against it from the other direction. To be precisely correct, the air-wave has perhaps seven or eight inches farther to travel to reach the inner, than to reach the outer, side of the membrane, so that it strikes the ear about one two-thousandth of a second sooner on the outer, than on the inner, side. This ordinarily produces no inconvenience; but where men are exposed to sudden heavy sounds, as in the turret of a battleship, they learn to keep the mouth open, to give the air-wave a free passage to the inner side of the ear, and thus to minimize the effect of the explosion.

The duplication of the ear is referable to the general scheme of duplication which embraces all the external organs that are not arranged on the median line of the body. It is consistent with the theory of design, but not necessarily probative of it, although it does, at ordinary distances, enable us to determine the direction from which a sound comes.

Finally, observe how even the relative *arrangement* of the eyes and ears is precisely such as would be expected from an intelligent and careful designer, and therefore furnishes additional evidence of design. Chance dumps things together without regard to order or consequences; intelligence does not. Chance would be as likely to arrange the eyes in the back of the head and the ears in the front, or both on the top, as to arrange them in any other position. But the designer of the human body adapted the legs to move it forward, not backward, and arranged the eyes in front to give warning of danger when moving forward. He arranged the ears in the closest possible proximity to the brain, where their connections to the auditory nerves would be reduced to a minimum in length and size, would not be in the way of the other organs, and would be most fully protected from external injuries. He was obliged to project the visual surface of the eyes even beyond the general surface of the body, in order to enlarge as far as possible the field of vision; and to protect them by the projecting brow and nose. On the other hand, in constructing the ear he was under no such limitations, but could arrange its working organs (the tympanum and its connections) deep within the head without in any way interfering with the hearing. This difference is due to the fundamental difference between the nature of light-waves and the nature of sound-waves. Light-waves, so called, are etheric impulses or disturbances radiating in straight lines in every direction from their common source. Strictly speaking, they are not "waves" at all, but rays as independent of each other as are the spokes of a wheel. Being composed of ether, which is inelastic, they can exert no force laterally but only straight ahead in the direction of their length. Hence it follows that we see only with the rays or radiations which actually come directly against the eye and therefore if the visual surface were not set out on a line with, or beyond, the surrounding surface of the face, our field of vision would be extremely limited. But air is an elastic medium, whose waves, therefore, consist not in expanding rays of *oscillation* but in expanding areas *of alternate condensation and rarefaction.* As one of these elastic areas passes in the vicinity of the ear it exerts its force, not merely straight ahead, but in every direction—it is for an instant, as if the ear were in the exhaust-chamber of an air-pump or the receiver of an air-compressor. Hence it is not necessary that the ear should be struck directly by an advancing wave—it is sufficient if it be subjected to the expansion or contraction of the surrounding air caused by the passage of the wave and, therefore, even if the ear-drum be arranged in a cavity or recess in the head, it will hear. The subject is well illustrated by placing tubes with their ends at the eye and ear; with the one, you can see only the object at which the tube is aimed; with the other you can hear in every direction.

The designer of the ear, knowing these facts, placed the ear-drum and its connecting mechanism in a deep recess in the side of the head, where they are effectively guarded from accidental injury; but he was obliged to place the eye at the surface, and guard it by other means. The relative arrangement of the organs of sight and hearing, therefore, together with the prominence of the one and the withdrawal of the other into its protecting recess, are exactly what we should expect from a creative hand guided by an intelligent mind thoroughly familiar with the nature of ether and air and with the laws of optics and acoustics. The form of man's external ear seems to have been selected for its beauty, like the coloring of the eye, and gives indication that its designer possessed in high degree the æsthetic faculty. In the beasts, where its construction is not plainly indicated as having æsthetic beauty in view, we find it in the form of an ear-trumpet, articulated to the head, and associated with a set of muscles by which the animal can turn it in any direction. The utility of this contrivance to the beasts is self-evident; but to man, possessing a higher degree of intelligence and reason, it was not necessary.

It is conceivable that superior adaptation to the animal's needs, coupled with the "survival of the fittest" may in the long course of ages, have determined the exact location of the eyes and ears; but, while conceivability is a necessary condition of proof, it does not in itself take the place or perform the functions of evidence. We are, therefore, at liberty to adopt any other theory that is conceivable and reasonable. Adaptation to a useful purpose does not account for origins, although it may for survivals. Where the origin of an organ cannot be explained on the theory of evolution, there is but one other theory which will explain it—the theory of purposive creation by an intelligent Creator. But that theory, when necessary to explain the origin, includes and accounts for the adaptation; and it is useless for the evolutionist to invent fine-spun hypotheses to account for the adaptation, when he cannot account for the organ itself. He should remember that, while the greater includes the less, the less does not include the greater; and that, while it may be interesting to speculate upon the immediate influences that caused the location of the eyes and ears where we find them, or upon the causes that equipped the ears of the dog, the horse, the rabbit and the deer, with a dirigible ear-trumpet, it does not relieve him from the necessity of explaining the eyes and ears themselves, nor from the necessity of explaining how the desirability of two dirigible ear-trumpets could create the motor-nerves necessary to put them under the control of the animal's brain. Here, again, are origins which adaptation is powerless to explain.

CHAPTER VIII.

The Nutritive System.

Let us take another example—the nutritive system of the human body. It is an extremely complicated combination of wonderful contrivances all working in coöperation for a common purpose—in fact, so complex that it would require a whole library to describe it in detail, and, therefore, the necessary limits of my work permit only a reference to the general plan of the system.

Let any intelligent person consider that plan and then say whether it does not clearly indicate the exercise of invention. It comprises: the alimentary tube, extending from the mouth through the whole length of the head, neck, chest and abdomen, to receive, prepare and digest the food, separate out its nutritive elements, and discharge the waste products; the stationing of the eyes and nose near the entrance of the tube, where they act as detectives to prevent the entrance of unclean and noxious substances into the mouth.:[1] the forming of the front portion of the long tube into a chamber (the mouth) adapted to receive and hold the food while it is undergoing the process of mastication; the arrangement, in, or in connection with, that chamber, of the powerful jaws provided with three kinds of teeth for cutting, tearing, or grinding, the different kinds of food, as their nature or condition may require; the tongue, assisting in presenting the food

[1] It will be instructive to compare this provision with that found in the leech, where ten little eyes are arranged immediately around the blood-sucking mouth for the obvious purpose of warning it not to fasten itself upon a tainted surface.

properly to the teeth; the salivary glands for elaborating and discharging into the mouth a fluid to assist in the acts of mastication and swallowing, and afterwards to aid the gastric juice in liquefying the contents of the stomach and preparing them for digestion; the organs of taste, located in the back part of the mouth, where they act as additional detectives to make a final test of the fitness of the food after it has been masticated and before it reaches the throat; a valve (the epiglottis) to cover the opening into the windpipe and prevent the food from "going down the wrong way;" automatic muscles acting progressively downwards, like the teeth or boxes of a mechanical conveyor, to force the food down through the throat and oesophagus into the stomach; the stomach, to receive the food from the oesophagus, complete the preparation for its digestion, and pass it along into the intestines; a system of glands in the walls of the stomach for elaborating the gastric juice and pouring it into the stomach; the pyloric valve at the outlet of the stomach to hold back the food till it is partially dissolved and in a suitable condition for digestion; the peristaltic movements of the internal walls of the stomach to agitate its contents and bring them successively to the neighborhood of the discharge opening (pylorus) into the upper bowel (duodenum); a similar peristaltic movement in the bowels to urge their contents along; the liver and the pancreas, two large organs situated near the stomach, which manufacture, respectively, bile and pancreatic juice, and deliver them together into the duodenum[1],

[1] Two ducts, one from the liver and one from the pancreas, unite to form a larger duct, which extends into the duodenum and conveys both fluids into it. It has been found that both fluids act with their utmost efficacy *only when mingled together;* and here we see a contrivance of such a peculiar and marked character as to indicate that their Creator foreknew this fact and planned the construction and confluence of the two ducts accordingly. They originate in separate and entirely distinct organs. The two fluids which they conduct

where they perform the principal part of the work of digestion; the lacteal and lymphatic tubes, more than five millions in number, arranged along the bowels and acting as a filter to separate the nutritious elements of the digested food (chyle and lymph) from the waste products; the thoracic duct, for conveying the chyle and lymph up to the base of the neck and there delivering the nutritive mixture into the subclavian vein, where it is mingled with the impure venous blood on its way to the heart, and is by the heart first sent to the lungs for aeration and purification and then to all parts of the physical system for the supply of nourishment to the body.

Thus the main alimentary process, from the entrance of the food into the mouth to the delivery of the chyle and lymph into the blood, is a continuous process, consisting of steps in regular and orderly sequence—each step preparing the way for the next—a process which brings into successful coöperation several millions of different instrumentalities ranging all the way from grinding-mills to chemical factories and automatic mechanical conveyors.

The heart, lungs and blood-vessels are among the most important members of this main system—if any can be said to be most important where all are indispensable. The heart is divided into two small compartments called auricles, whose office is to receive the blood from the veins, and two larger compartments called ventricles, whose function is to expel the blood into the arteries. The auricles are in the upper part of the organ, and communicate with the ventricles through passages provided with valves opening downward. The ve-

to the duodenum are of very dissimilar chemical composition. I can conceive of nothing but intelligent design which could have led these two ducts toward each other and united them in one. Certainly there is nothing in Darwin's laws of Evolution which can account for this remarkable fact.

nous blood from the upper and lower extremities enters the right auricle, whence it passes to the right ventricle, from which the next contracting "beat" expels it through the pulmonary artery, and its branches and their innumerable subdivisions and "capillaries," into every part of both lungs.[1]

At the same time, air drawn from the windpipe into every part of the lung tissue, through the bronchial tubes and their minute subdivisions, comes everywhere into such close proximity to the artery and its capillaries,[1] that an exchange is able to take place between the air-tubes and capillaries, by which the former give up their oxygen, to consume the impurities of the blood, and receive back the products of the combustion, which they deliver over to the windpipe to be expelled from the body. The capillaries, at their extremities, open into equally minute veins, which unite into larger veins that return the blood, now purified, to the left auricle, whence it passes through the valved passage into the left ventricle, and is by the next beat of the heart driven into the aorta, and thence to every part of the body. The combustion that takes place in the capillaries of the lungs contributes no inconsiderable heat to the whole body; and that is augmented by the friction of the blood in its vessels, the friction of the muscles when in action, and the chemical actions and reactions going on continually throughout the physical system.

I have described the lung and heart-mechanism with some particularity, in order to emphasize the ingenuity of its construction, and especially to show the exact correspondence of the heart to the double-acting force-pump, one of man's most ingenious inventions. No one ever questioned the ingenuity

[1] The work which the heart does in twenty-four hours is equivalent to that required to raise one ton over 92 feet high.

[1] It is estimated that the minute air-passages of the lungs number 725,000,000, exposing the blood to an air-surface one hundred and thirty times as large as the entire surface of the body. (Prof. E. T. Reichert, in *Am. Text-Book of Physiology,* Vol. 1, p. 396.)

of the man who invented the pump, although it may be that he learned how to do it from a study of the valves, chambers, and alternate contractions and expansions, of the heart; just as Dollond learned to make the telescope achromatic from a study of the lens of the eye. To *understand* the action of the heart requires a knowledge of mechanical principles; is it conceivable that it required less to plan the organ and to construct and arrange its chambers, passages and valves? That they now come into existence by natural processes of growth, as do all the physical organs and structures, does not dispose of the difficulty, which consists in the fact that they are formed in accordance with a manifest *plan* and a very ingenious one at that. They did not create themselves, and therefore did not originate that plan. They have no mind; and yet the forces of nature, in forming them, were apparently guided by mind. Contrivance and invention are explainable only by one theory, that of the action of a contriving and inventive mind; these organs exhibit convincing evidence of contrivance and invention, and, consequently, convicing proof of the action of such a mind. That they grow by natural processes shows that the mind which originated the plan controls the forces of nature and accomplishes its purposes through those forces.

I have called attention to the inter-action of the minute air-vessels and blood-vessels of the lungs, and have referred to it as producing a combustion of the impurities of the blood brought there by the circulation. Any intelligent high school boy can explain that a fire is simply the union of the oxygen of the air with the fuel. When we see a person making a fire we do not require a scientific argument to convince us that he has a purpose or design in making it, nor that his formation of a purpose or design proves the action of mind; when we see nature making a fire in the lungs, is not the presumption of design, and of mental action, equally conclusive? If a fire should mysteriously break out at night in an unoccupied building would anybody (except, perhaps, a materialistic philosopher) doubt that somebody had kindled it? The first inquiry would be: Was it kindled by accident, or intentionally? If investigation should reveal that the materials for kindling a fire had been carefully assembled at the spot the suspicion of incendiarism would be strongly justified, and the next inquiry would be as to the motives of the incendiary—whether the building was heavily insured or any person had reason for revenge upon the proprietor.

In the case of lung-combustion, investigation shows that arrangements were carefully made beforehand to ensure its occurrence—combustible materials from places remote from each other were assembled on the spot and in such relation that they were sure to ignite. Intention is therefore proved, and we proceed to look for a motive. We examine the venous blood on its return to the heart, and find that it has become badly deteriorated. It is visibly dark in color, impure, and no longer fit to sustain life. We examine it after its subjection to the oxygen of the air in the lungs, and find that it is now bright in color, purified, and re-vitalized—the fire has destroyed everything that was of an injurious character. We examine the air expelled from the lungs, and find that it has been depleted of its oxygen, and that it is carrying away the products of the combustion. The case is now clear—the elaborate arrangement of the arteries, veins, air-tubes and heart, was intended to keep the blood from impurities, fit it to sustain life, and convey it to every part of the body. The wonderfully ingenious mechanical and chemical combination did not originate through chance, but evidently through intelligence—it was *invented* by the author of nature and "nature's works."

Closely connected with the nutritive system so as to form practically an integral part thereof, is the *lymphatic system.* This is an extensive system of ducts, reservoirs, check-valves, and glands, coöperating with each other and with the liver, intestinal walls, and blood-vessels, to secret or separate from the chyle and the blood a thin colorless liquid termed lymph, which performs a most important function in building up the tissues of the body. Apparently lymph is substantially the same in composition as the watery and colorless liquid constituent of the blood (termed by physiologists the "plasma" of the blood) when separated from the red and white corpuscles and the blood-plates. It appears first in innumerable minute irregular gaps in the tissues. These gaps, when examined with the microscope, are seen to communicate in various ways with one another, and with minute lymphatic vessels, which latter, when traced onward from their beginnings, presently assume a structure comparable to that of narrow veins with very delicate walls and extremely numerous valves. These valves open away from the gaps of the tissues, as the valves of the veins open away from the capillaries. The lymphatic vessels unite to form somewhat larger ones, each of which, however, is of small caliber as compared with a vein of medium size, until at length the entire system of vessels ends, by numerous openings, in two main trunks of very unequal importance, the thoracic duct and the right lymphatic duct. The latter is exceedingly short, and receives the termination of the lymphatics of a very limited portion of the body; the termination of all the rest, including the lymphatics of the alimentary canal, are received by the thoracic duct, which runs the whole length of the chest and for some distance below it. Both of the main ducts have walls which, relatively, are very thin; and, like the smaller lymphatics, the ducts are abundantly provided with valves so disposed as to prevent any regurgitation from either duct into its branches. At the opening of each duct into the subclavian vein a valve exists which permits the free entrance of lymph from the duct into the vein, but forbids the entrance of blood from the vein into the duct.

It is a peculiarity of the lymphatic system that some of its vessels end or begin by open mouths in the so-called serous cavities of the body—those large irregular interstices between organs, the membranous walls of which interstices are known as the peritoneum, the plurae and the like. For present purposes, therefore, these serous cavities may be regarded as vast expansions of portions of the lymph-path. Another peculiarity of the lymphatic system depends upon the presence of the lymphatic glands or ganglia, which also are intercalated here and there between the mouths of lymphatic vessels entering and leaving them. These bodies are believed to be of importance in producing leucocytes (white corpuscles) which get from them into the lymph-stream and are eventually brought into the blood. The lymph-path as a whole, extending from the tissue-gaps to the veins at the root of the neck, therefore both differs from, and in some respects resembles, the blood-path from the capillaries to the same point[1].

Treating of this subject, Gray's Anatomy (p. 772 et seq.) says: "Lymph is obtained from the blood-plasma. From lymph the body cells obtain food, into lymph they discharge their waste materials, and there is a distinct lymphatic circulation, the constituents of the plasma passing into the perivascular lymph-spaces and returning to the heart by way of the lymphatics and certain veins. . . .

"The lymphatics have derived their name from the appearance of the fluid contained in their interior (*lympha*, water). They are also called absorbents, from the quality they possess

[1] *American Text-Book of Physiology*, Vol. 2, pp. 49, 71, and 145-6.

of absorbing certain materials from the tissues and conveying them into the circulation. Larger lymphatics are called trunks and the largest are called ducts. . . .

"To this system also belong the *lacteal,* or chyliferous vessels. The lacteals are the lymphatic vessels of the small intestines, and differ in no respect from the lymphatics generally, except that during the process of digestion they contain a milk-white fluid, the chyle, which passes into the blood through the thoracic duct. . . .

"The lymphatics are exceedingly delicate vessels, the coats of which are so transparent that the fluid they contain is readily seen through them. . . . They retain a nearly uniform size, and may be cylindrical in shape, but usually are interrupted at intervals by constrictions which give them a knotted, beaded, or sac-like appearance. These constrictions are due to the presence of valves in the interior of the vessel. . . . The valves are not found in fixed situations, and vary in number. Between the ends of the fingers and the axillary glands Sappey counted from sixty to eighty.[1] They are arranged in pairs and resemble the aortic semi-lunar valves. . . . The lymphatics of any part or organ exceed the veins in number and in capacity, but in size they are much smaller."

The most striking differences between the blood-system and the lymph-system are, (1) that, in the former the circulation depends upon the pumping action of the heart, and in the latter, it does not, but depends, during one-half of its circuit, upon the forward pressure of the lymph constantly exuded from the walls of the capillaries and other sources, and upon the lymphatic check valves which prevent it from

[1] This would indicate about one hundred and forty of these valves in the two arms. There are many thousands in the whole system.

traveling backwards; (2) that the movement of the lymph through the tissues is therefore slower than that of the blood-circulation through the arteries and veins; (3) that the arteries, veins and heart constitute, by themselves alone, a complete circulation-system; whereas, the lymphatic ducts do not, but only carry the lypmh through one-half of its circuit, making use of the veins and arteries to carry it through the other half; and (4) that the lymph contains no red discs nor blood-plates. The two circulation-systems are thus indissolubly locked together into one compound alimentary-transportation system, in which the lymph performs the duty of carrying the nutritious food-elements from the small arteries and capillaries to the tissue wherein they are utilized.

In addition to the provisions above described, there is what may be regarded as a subordinate department of the alimentary system, the functions of which are performed principally by means of minute absorbent vessels in the skin and in the walls of the intestines. Thus life may be supported by bathing the skin with concentrated food-solutions, or by injecting them into the lower bowel (rectum). Medicinal solutions are also applied in both of these ways, and with beneficial results. The absorbents of the skin and intestines may be regarded as forming a part of the lymphatic system.

I invite particular attention to the check-valves in the arteries, veins and lymphatic ducts and passages. A check-valve is a valve adapted to permit fluids to traverse a pipe or passage in one direction freely, but automatically to close against their passage in the opposite direction. Man has invented many forms of check-valve, which he uses in the various structures employed in his business operations. In his tide-water-mill-dams he has for ages employed check-valves, which open when the tide begins to rise and close when it begins to ebb, to allow the reservoirs to be filled with tide-water, and retain the water for use. The check-valves are, in their principle, substantially like the two-leafed check-valve formed by the junction of the thoracic duct with the sublavian vein, to permit the chyle and lymph to enter the vein but prohibit blood from leaving the vein to enter the duct. In many of his force-pumps, man uses substantially the same arrangement of check-valves that is found in the human heart (and in the arteries and veins), and for the same purpose. Who can reasonably deny the exhibition of intelligent design in such an arrangement! In the pyloric valve at the outlet from the stomach into the upper bowel, we find a check-valve whose operation so closely resembles the miraculous that it seems to defy rational explanation and almost to suggest the existence of intelligence in the valve itself; for it closes to retain the food in the stomach till prepared for digestion, but as often as different portions, duly prepared, present themselves at the passage way, it partially opens to let them through, and then closes against the rest—like the doorkeeper who opens the door for ticket-holders, but holds it closed to all others. How came that particular valve to be endowed with the capacity of apparently intelligent discrimination between two pieces of the same beef-steak—the one prepared, and the other not prepared, for the immediate action of the pancreatic and hepatic fluids! No other valve in the whole physical system possesses such a power or needs it; but *this* valve needs it for the due performance of its duties and has been provided with it! Surely, it requires less credulity to believe that this valve, with its unique and inexplicable power of deliberate choice, was planned by some inscrutable Intelligence which manifests itself in the works of nature, than to believe that it came into existence by blind chance, or by progressive modification and the survival of the fittest. The first theory is conceivable and intelligible; the last two are not.

Nature has arranged thousands of check-valves[1] in the arteries, veins and lymphatic ducts throughout the body, to prevent any possible back-flow of the fluids passing through them. These check-valves are not mere accidental obstructions in their respective channels, like rocks or stranded logs in the bed of a river, but they are true *valves,* attached to the walls of the several vessels, and carefully planned and artistically constructed to perform their peculiar and self-evident office. I call upon Evolution either frankly to admit their formation by intelligent design, or else to furnish some theory of their origin that will satisfy the demands of human reason. What blind "force of nature" could have constructed these valves to open freely to the movement of a liquid in one direction, and to close obstinately against it in the opposite direction? Forces are generally believed to operate uniformly, under the control of immutable "laws"; but here is a vital force which, if it created these valves, deliberately, and beforehand provided a positive check against *itself,* to come into instant operation, resisting force with superior force, in case any defect in the action of the physical organs should at any future time happen to cause an accidental reversal of the blood-current or lymph-current. Let Evolution explain away this apparently clear and convincing evidence of creative design, if it can!

There is still another provision in the human system (germane to the topic under discussion because also connected with the general nutritive scheme) which is strongly indicative of creative design. The adrenals, or supra-renal capsules (as they are called by physiologists and surgeons)

[1] It was through these valves that Harvey discovered the circulation of the blood.

are two flattened, more or less triangular or cocked-hat shaped bodies, resting by their lower border upon the upper border of the kidneys. They are glands, very abundantly supplied with nerves. If they be removed or incapacitated, the man dies within two or three days, or sometimes within a few hours, with pathological symptoms resembling those of an obscure and obstinate disease known as Addison's disease. They were practically unnoticed by the scientific and medical world, and their functions were unknown, until the year 1856, when Brown-Sequard discovered that if they were removed or destroyed, great prostration, muscular weakness, acceleration of the heart-action, and abnormal blood-pressure, immediately supervened, followed by death within a few days. The part they played in the physical organization at once became a matter of great scientific interest, and the subject of careful study and experiment, in which Brown-Sequard's observations have been fully confirmed and much important information bearing upon the nature and action of these glands has been obtained. They furnish very conclusive evidence of the production of an internal secretion that is absolutely necessary to supplement the normal action of the other organs or some of them. If all the other organs of the physical system are free from disease, and the adrenal glands are removed, the animal dies.

It has been discovered that by removing the adrenals from a healthy animal, preparing an extract from them (adrenalin), and administering the extract at regular intervals to a patient who is suffering from the partial or total loss of his adrenal glands, he may recover and remain in good health for years. Moreover, it has been found by experiment that, fifteen minutes after a dog had apparently died (its breathing and heart-action having ceased for that length of time), an injection, into the carotid artery, of a mixture of salt solution and adrenalin restored the animal completely to life. These facts indicate that the function of the adrenal glands is to supply to the blood a powerful stimulant, which is absolutely necessary to vital action in mammalian life.

Curiously analogous to the action of the adrenals, is the action of the parathyroid glands. These are three or four little glands, each about the size of a grain of wheat, situated in the neck immediately behind and in close connection with the thyroid gland. Their existence was not known until the year 1880, and their function remained unknown until 1908. Then, it was found that they furnish to the blood some unidentified substance which, in mammals, is absolutely necessary to nutritive assimilation. Previous to 1908, it was supposed that this unknown substance was furnished by the thyroid gland; and, as it was suspected that goitre and cretinism were due to some imperfect action of the thyroid gland, an extract of the thyroid gland of a rabbit or other animal was administered in such cases and with salutary effects. But, since the discovery of the parathyroid glands, it has become known that the thyroid gland has little or nothing to do with goitre and cretinism, and that the good effects of the thyroid extract were due entirely to accident —the accident of inadvertently removing from the rabbit or other animal its parathyroid glands with its thyroid and making the extract from both together.

A case illustrating the remarkable effect of parathyroid extract was reported by cable from London in December, 1908, in the following words:

"London, Dec. 22.—The experiment of treating with thyroid extract a girl physically and mentally undeveloped has had a remarkable success. The patient is Mildred Hart, who, although 23 years old, had the development of a child of only five years, and was 33 inches tall. Her teeth were the same as a child's, her skin was cold and harsh, and her facial features were undeveloped. The soft spot on the top of a baby's head could be felt on her. She had no appetite and was mentally unobserving. This was in October.

"A physician diagnosing the absence of the thyroid secretion took charge of the case. He administered twelve and a half grains of the extract of thyroid in the glands daily. The patient has grown two and a half inches. Her skin is moist and warm, her face is considerably developed, and she has cut several new teeth. She is constantly hungry.

"The most wonderful change, however, is in her mental condition. She has become extraordinarily loquacious, using a vocabulary she could not have acquired in two months, which shows that she unconsciously listened to and stored up words without the power of employing them."

How strange that the little adrenals should have been contrived to prepare for the blood an ingredient that was necessary to keep the body alive; and that the parathyroids should have been contrived to create for the circulation another ingredient that was necessary to enable the body to grow to its normal size and develop its normal faculties! Did Evolution do these things? If so, she must have supernatural intelligence,—an intelligence capable of foreknowing, and deliberately making ready for, specific future events—for, if she had not formed the adrenalin in the very first mammalian body it would have been impossible for that body to live or man ever to have been created; and if she had not provided that body with parathyroid glands it could never have developed beyond infancy. Only one thing can account for the origin of the adrenals and the parathyroids, and that is, the Divine Intelligence that foreknew the necessity for their creation.

We should like very much to know what Evolution has to say about the *leucocytes.* These are free cells, approximately one three-thousandth of an inch in size, and apparently originating in the lymphatic ganglia or tissue. Billions of them exist in the lymphatic and blood circulation, where their presence is necessary to the life of man. They almost seem to have an independent life of their own; and have sometimes been called "wandering" cells, from the fact that they have been seen to work their way through the walls of the capillaries into the surrounding tissue where they roam about at their own sweet will seeking what (or whom) they may devour. We are indebted to the distinguished German scientist, Metchnikoff, for much information about them. From their apparent voracity, he terms them phagocytes or eating-cells (from *phagein,* to eat, and *cytos,* cell). He considers them microscopic policemen, exploring the blood-vessels, lymphatics and tissues to rid the human system of disease-germs, which they seem able to accomplish so long as they themselves remain in a healthy and vigorous condition.

Now, so far as is known, there was no pre-existing structure from which these leucocytes or phagocytes could have been derived by progressive modification and survival of the fittest; and therefore the votaries of Evolution are wholly unable to account for their existence in the system. In structure, capability of locomotion, and method of accomplishing it, they resemble, in all observable particulars, the amœbæ, the lowest form of life yet discovered. But, in the human system, they are absolutely necessary to its continued existence. When they become destroyed or incapacitated for the performance of their work, sickness and death inevitably result. The red corpuscles of the blood are undoubtedly a product of the system itself, where the organ for the reproduction of them, in the adult, has satisfactorily been shown to be the red marrow of the bones. There is strong reason for believing that the white corpuscles also have originated in the system itself; and none for a contrary conclusion. Their enormous number, their diffusion throughout all parts of the system, and their function of protecting it from injurious germs, clearly indicate creative design; and the absolute inability of the Darwinian theory of evolution to account for them on any other hypothesis strongly supports that conclusion.

Let us cite another example of intelligent contrivance in the "works of nature." The female has a set of organs peculiar to herself, whose function is to perpetuate the race. During the period of gestation she needs her ordinary supply of food, and a larger supply for the rapidly-growing fœtus—and, strange to say, at that particular epoch, her alimentary system seems to gird itself for a supreme effort—it furnishes all the food needed for both, and generally more than is needed; for she grows fat notwithstanding the unaccustomed strain upon her resources. During this period her blood conveys aliment to the new being through a tube specially prepared for the occasion, and which is thrown away when its purpose is accomplished. At the end of the period, her blood-vessels turn the child's aliment in a new direction, to a point where it will be available for his use under the new conditions. It is no longer so while in the same food-form as before, and the mammary glands therefore start their chemical factory into operation, transforming it into milk available to him through the only form of organ which he, at that time, is able to use. How strange and wonderful it all is! And what a supreme and unanswerable proof of design in the works of nature! What is the use to ask Evolution about it! She cannot account for the equipment of the milk-factories in anticipation of the event, nor for the invention of the apparatus and chemical process by which milk is produced from blood—to say nothing of the other mysteries!

Until after the time of the American Civil war, breech-loading guns were not in general use, and we had to introduce the charge through the muzzle, and force it down by means of a ramrod. In the nutritive system, nature provided a long tube which has to be charged several times a day, and she was obliged to employ means for forcing the charge down. A ramrod is not available, for several reasons—it would be inconvenient to carry and operate; and the tube is of varying diameter and very far from straight. She therefore had to invent some better contrivance for forcing the solid and liquid food down through the throat and esophagus into the stomach, and for impelling it along in the stomach and intestines. Accordingly, she invented the *peristaltic motion* (peristalsis) of the lining membrane of the alimentary tube—one of the most astonishing contrivances to be found in the whole range of nature's works. In the *American Text-Book of Physiology* (Vol. I, p. 372) Dr. Howells, Professor of Physiology in Johns Hopkins University, describes the peristaltic motion as follows:

"The mode of contraction of the plain muscle in the walls of some of the viscera, especially the intestine and the ureter, is so characteristic as to be given the special name of peristalsis. By peristalsis, or vermicular contraction as it is sometimes called, is meant a contraction which, beginning at any point in the wall of a tubular viscus, is propagated along the length of the tube in the form of a wave, each part of the tube as the wave reaches it passing slowly into contraction until the maximum is reached, and then gradually relaxing. In viscera like the intestine, in which two muscular coats are present, the longitudinal and the circular, the peristalsis may involve both layers, either simultaneously or successively, but the striking feature observed when watching the movement is the contraction of the circular coat. The contraction of this coat causes a visible constriction of the tube that may be followed by the eye as it passes onward."

By this contrivance, the food, as it enters the throat, excites a peristaltic wave of contraction behind it, which virtually seizes the food and forces it along the passage until it is safely lodged in the stomach. Wave follows wave until the result is reached. In the stomach the same motion is set up, churning the food around and around until the pyloric valve is willing to let the chyme pass into the duodenum. In the duodenum and the smaller intestines, the same motion is continued so long as there is anything to be moved forward. In passing water from the bladder, a similar motion is set up in the passage (ureter). Thus nothing is left to chance,—but appropriate and effective mechanism is provided for every anticipated emergency. No words of mine can add impressiveness to this example of Creative wisdom and ingenuity. Nothing like it is possible in the crude structures invented by man.

CHAPTER IX.

The Breathing Apparatus.

The great cavity of the human body is divided by the diaphragm into two compartments—the chest or thorax, containing the lungs and heart, and the abdomen, containing the stomach, bowels and other organs connected with the nutritive system.

The chest is an air-tight expansible and contractible box, the cone-shaped top of which is closed in by the structures of the neck, the walls formed by the vertebral column, breastbone (sternum) and ribs with their connecting cartilaginous and muscular tissue, and the bottom, by the arched or dome-shaped diaphragm. The lungs are in the form of two large flattened bags, in contact with the walls of the chest and communicating with the atmosphere through a passage formed by the windpipe (trachea), the throat and the nose and mouth. They are not composed of muscular tissue, and are consequently passive during the act of breathing except as their elasticity aids in the expulsion of air from them. They are inflated by a downward flexure of the diaphragm, which enlarges the capacity of the chest and causes air to rush into the lungs and expand them to fill the partial vacuum thus formed. The whole breathing-apparatus is, therefore, a valveless bellows, in which air is admitted and expelled through the same conduit. In ordinary breathing, this bellows is operated automatically, drawing air into the lungs by the involuntary downward flexure of the diaphragm, and allowing it to be expelled by the elasticity of the lung-tissue and of the enclosing walls of the chest and abdomen.

Those ribs which enclose the chest are articulated to the vertebral column, from which they slant downward and forward and then upward to the sternum, to which their front ends are connected by ligaments. They are curved and rock slightly on their axes. A double effect of this construction is, that if the lower ribs of the chest be swung inward they raise the sternum, causing all its connected ribs to swing upward and at the same time to rock slightly on their axes, so that the cavity of the chest becomes thereby laterally enlarged in all directions.

The diaphragm is an air-tight, dome-shaped, partition, extending across the great cavity of the trunk, to the walls of which its edges are strongly attached. In structure, it is a thick muscular membrane, capable of exerting ample force to swing the lower ribs of the chest inward and thus elevate the sternum and upper ribs. Its ordinary operation is automatic; but being in itself a muscle it can, at will, be actuated with a force greater than that which is required for the normal automatic action of the breathing-apparatus. The action of the diaphragm is supplemented and assisted (especially in deep breathing) by that of a large number of pectoral and intercostal muscles, which, like the diaphragm, work automatically in ordinary breathing.

Without resorting to the theory of Creative design, it is impossible to conceive of such a muscle as the diaphragm growing across the great cavity of the body. No chance could cause it to grow there. Think of blind and unreasoning Evolution producing such an organ! How would she go about the work of constructing it? It is to be a thin but strong sheet spanning a great open space, as a suspension bridge spans the open space between the banks of a river. Man constructs suspension-bridges by leading separate wires across the river, anchoring their ends firmly at each bank, and then wrapping the wires with other wires to hold them together in the form of a cable. With two such cables, parallel to each other, it is an easy matter to connect them by cross-beams and to support the floor or "deck" of the bridge upon the cross-beams. But nature cannot use that mode of construction; and, besides, the chasm to be bridged is circular and its walls must be firmly connected to the bridge all around the circle.

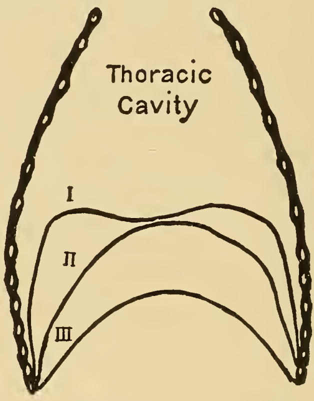

Fig. 5. Diagram showing chest and diaphragm. I, Diaphragm when lungs are deflated; II, Diaphragm when lungs are partially inflated; III, Diaphragm in position to inflate lungs fully.

Nature therefore proceeds on a different plan. She draws a line (so to speak) around the inner wall of the trunk, indicating where the edges of the diaphragm are to be attached. Then she causes minute muscle-fibres (millions of them) to start out all along that line and grow towards the centre of the circle, where they finally meet and become united in a strong central tendon. These growing muscle-fibres are laterally connected together throughout their whole length, so that when their ends meet at the centre, the entire chasm has become completely decked over by a strong sheet or web of muscular tissue. Meanwhile, she establishes a connection between the muscle-fibres and the brain, by means of motor nerves that enable the latter to flex the diaphragm at will; and she also connects them to the sensory nerve system.

Now I ask the judgment of any sensible person whether such an organ as the diaphragm, and such a construction, could have arisen through the action of forces not under the direction of intelligence! It is sheer insanity to imagine such a thing.

The utmost ingenuity of man has never been able to invent a mechanical apparatus at once so complicated in construction and so perfect in operation as is the breathing apparatus. The problems which its great Inventor had to solve were the most difficult ever presented for consideration. First, the blood, constantly supplied and constantly vitiated by use, had to be constantly purified; and oxygen was the only agent that could purify it. So lungs had to be invented to enable it to be brought into contact with the oxygen of the air. Secondly, to bring it into contact with the air, a powerful force-pump was needed and supplied, together with a complicated system of arteries and veins through which to circulate the blood through the lungs and thence to all parts of the body. Thirdly, to purify the immense quantity of blood that courses through the lungs many times every day, their whole structure is practically occupied with blood-vessels and air-vessels, leaving no room in it for muscles with which to expand and contract it for breathing. It followed from these facts that the only practicable way to operate the lungs was to enclose them in an air-tight expansible and contractible box and operate the box. To make the box expansible and contractible was, from our finite point of view, a problem of no easy solution; for its lateral walls could not be made flexible without exposing the heart to injury; its top was necessarily immovable; the space below the heart and lungs was filled with vital organs whose functions could not be interrupted or impeded without disaster; and there was no available room for mechanism. The construction adopted was, therefore, apparently the only possible solution of the problem. The diaphragm was accordingly extended across to act as a flexible bottom for the box, was strongly attached to the walls of the chest, and was made of muscle-tissue, controlled by motor-nerves, so that its central part could be flexed upward and downward to reduce or increase the capacity of the box at will. The walls of the box were reinforced by a strong framework of ribs to prevent their collapse and to guard the heart and lungs from accidental injury.

To enable the lungs to contract readily, for the purpose of expelling the breath, their substance was made elastic, so that it could automatically close its air-passages whenever the diaphragm and the muscles of the chest allow it to do so.

Each lung is covered with a thin membrane, the pulmonary pleura, which lies in constant contact with a similar membrane, the parietal pleura, that lines the walls of the chest. In expanding and contracting the chest, thus inflating and deflating the lungs, one of these two membranous surfaces slides upon the other. This rubbing movement of the two pleuræ is constantly going on, night and day; but the Author of nature has provided that the rubbing surfaces shall be kept anointed with a lubricant so perfect that no friction is experienced from it.

No one realizes the immense amount of hard work which the diaphragm and chest-muscles have to do in order to elevate the ribs and draw in the breath sixteen times every minute during life.[1] And yet, notwithstanding this unremitting toil, these muscles never experience the sensation of fatigue, but are just as fresh after ninety years of exercise as at the end of the first hour! This ability of the diaphragm and the chest-muscles (and of the heart also) to work without fatigue has been for ages an insoluble puzzle to the physiologists, and is no nearer to an explanation to-day than it was a century ago. All these organs are muscles, normally acting automatically, and never getting tired; whereas every muscle acting in response to our will soon experiences fatigue and is obliged to rest.

Fatigue, the necessity of rest to recover from it, and the necessity for sleep, are explained by science as follows: Muscular action either produces, or is produced by, a chemical action within the muscle itself, by which minute portions of the muscle-tissue are consumed, or in other words decomposed, in order to generate force—just as fuel is consumed in generating steam-force or electric force. The ashes and gases of the tissue thus consumed, remain in the muscle until they can be removed and the consumed tissue replaced from the blood; and while they remain they are poisonous to the muscle. The exchange of the waste products for the fresh building-materials cannot be accomplished while the muscle is at work, because decomposition is going on more rapidly than recomposition. Hence, the muscle must be allowed to rest from time to time in order to restore it to its original vigor.

All parts of the physical system are thus continually wasted and renewed—the muscles more actively than the parts which have less work to do. The result is, that the

[1] The heart and the lower end of each lung rest upon the diaphragm and are carried up and down with it about an inch and a half and two inches, respectively. (Sibson's *Anatomy.*)

whole system becomes gradually poisoned by its own waste matter, and a longer period of rest and general recuperation is required. When this general poisoning becomes so great as to reach the nerve-centres of the medulla oblongata, it inhibits the action of certain ganglions (as yet unidentified), and we become unconscious, or, in other words, sleep, till the system has had time to recuperate.

It follows from this, that the very nature of muscle is such that it tires easily and needs frequent and considerable periods of rest—periods whose duration is proportionate to the amount of work done. And yet here are muscles (the heart and the muscles of the breathing-apparatus) that never tire and never rest! And, strange to say, they are the muscles that do more work than all the others put together!

Is it a mere chance coincidence that these muscles happen to be the only ones whose resting for even a few brief minutes would inevitably cause death— whose action must therefore be automatic, for, otherwise, sleep would be equivalent to death? Or, on the other hand, are these things an absolute demonstration of intelligent Creative design? In my judgment, there can be but one answer to this question. *Coincidences,* and at *the same time the necessity for them,* do not, according to human experience, occur together unless in response to the dictates of a controlling will. In the breathing apparatus and the heart, they concur in a manner so extraordinary, and with results so vitally important, as to leave no reasonable doubt of Creative design.

And it should be remembered that the breathing-apparatus constitutes but one complex contrivance in a great system of equally complex contrivances, all correlated to it and to each other in so wonderful a manner as to leave no doubt of a general *plan* involving and uniting the whole in one vast contrivance. For the breathing-apparatus actuates the lungs to breathe air to purify the blood; the heart pumps the blood to them to be purified; the purified blood and the lymph convey to all the organs their building materials and remove their waste products; the nutritive organs supply the blood and lymph with everything that the physical system needs; and each organ is imperatively necessary to the action, and even to the continued existence, of every other. If there was such a general plan, then there can be no longer any doubt of the Divine Intelligence that formed the plan. If there was not such a plan, then human reason is worthless, and its conclusions are idle dreams. The Evolution of such a combination of complex and coöperating structures, or any one of them, is inconceivable, unless it be an evolution directed and controlled by intelligence—and that is *creation.*

In my opinion, no single structure, in the whole extent of the animal kingdom, is more absolutely conclusive of the exercise of *mind* in the planning and construction of nature's works, than the one to which I will now refer. In examining it, you almost *see* the operation of the creative mind! Yet this wonderful structure is so simple that a child can understand it as clearly as an adult,—which gives it a peculiar value for the purposes of my argument. I will borrow Professoı Ryner Jones's description of it from the first volume of his *Natural History of Animals,* p. 6, where he says:

"There is one elegant arrangement connected with the breathing-tubes of an insect specially worthy of admiration; and perhaps in the whole range of animal mechanics it would be difficult to point out an example of more exquisite mechanism, whether we consider the object of the contrivance or the remarkable beauty of the structure employed. The air-tubes themselves are necessarily extremely thin and delicate; so that on the slightest pressure their sides would inevitably collapse and thus completely put a stop to the passage of air through them, producing, of course, the speedy suffocation of the insect, had not some means been adopted to keep them always permeable; and yet to do so, and at the same time to preserve their softness and perfect flexibility, might seem a problem not easily solved. The plan adopted, however, fully combines both these requisites. Between the two thin layers of membrane which form the walls of every air-tube, a delicate elastic thread (a wire of exquisite tenuity) has been interposed, which, winding round and round in close spirals,

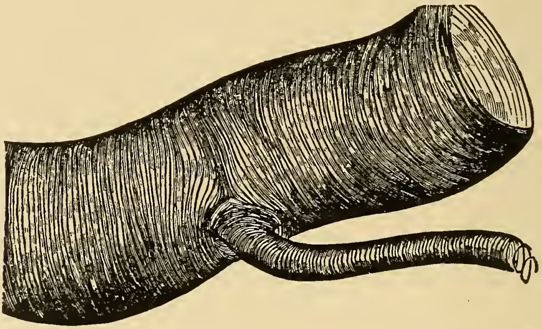

Fig. 6. Air-pipe of fly.

forms by its revolutions a cylindrical pipe of sufficient firmness to preserve the air-vessels in a permeable condition, while at the same time it does not at all interfere with its flexibility. This fine coil is continued through every division of the *trachea,* even to their most minute ramifications, a character whereby these vessels are readily distinguished when examined under the miscroscope."

Gosse, quoting and commenting upon the passage above, says:

"Man has imitated this exquisite contrivance in the spiral wire spring which lines flexible gas-pipes; but his wire does not pass between two coats of membrane. One of the most interesting points of the contrivance is the way in which the branches are (so to speak) inserted in the trunk, the two wires uniting without leaving a blank. It is difficult to describe how this is done; but by tracing home one of the ramifications you may see that it is performed most accurately,—the circumvolutions of the trunk-wire being crowded and bent round above and below the insertion (like the grain of timber around a knot), and the lowest turns of the branch-wire being suitably dilated to fill up the hiatus.

"You must not suppose, however, that the whole of one tube is formed out of a single wire. Just as in a piece of human wire-work the structure is made out of a certain number of pieces of limited strength, and joinings or interlacings occur where new lengths are introduced, so, strange to say, it seems to be here. It is strange, I say, that it should be so, when there can be no limit to the resources, either of material, or skill to use it; but so it is, as you may see in this specimen, which has been dissected out of a body of a silk-worm. The spiral is much looser here than in the air-tube of the fly, the turns of the wire being wider apart; and hence its structure is much more easily traced. Here you see in many places the introduction of a new wire, always commencing with the most fine-drawn point, but presently taking its place with the rest so as to be undistinguishable from them. In some cases certainly (perhaps this may be the explanation of the phenomenon in all) the wire so introduced may be found to terminate with the like attenuation before it has made a single volution, and seems to be inserted when the permanent curvature of the pipe would leave the wires on the outer side of the curve too far apart, half a turn, or even much less, then being inserted of supernumerary wire."

No words of mine could add anything to the interest or conclusiveness of the simple facts.

But it is not alone in insects that this non-collapsible tubing is found. In man and his mammalian relatives, we find substantially the same invention in the windpipe (trachea). There, however, the construction is slightly modified, to suit the exigencies of the case. Strong cartiliginous rings, instead of a spiral wire, are enclosed between the two

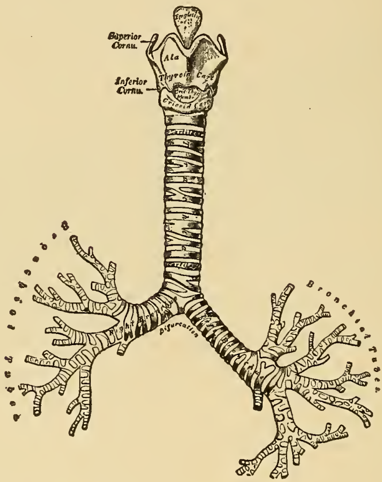

Fig. 7. Front view of trachea.

layers of flexible membrane of which the pipe is composed, to guard it against collapse. The rings extend only around the front and sides of the trachea, about two-thirds of its circumference, the interval between their posterior extremities being bridged over by the membrane.

Without this substantial reinforcement, the tube would be liable to be closed by any accidental pressure upon it, the breath stopped, and in a few minutes the animal would be asphyxiated.

The non-collapsible tube, whether existing in the insect's spiracles or in man's breathing apparatus, is made non-collapsible in substantially the same way; and it needs no argument to prove that it was thus made, in both instances, for

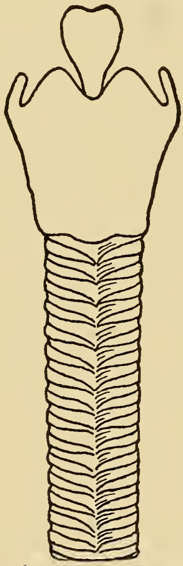

Fig. 8. Rear view of trachea. Bronchial tubes omitted.

the same purpose. The argument that was used with such fatal effect against some of Paley's illustrations of creative design, namely, that the animal found itself in possession of a given structure or appurtenance and discovered that it could be made serviceable, has no place here; *this* apparatus was not merely serviceable—it was absolutely *necessary* to life—without it, the whole human race would have died out before it ever reached the distinction of standing on two legs. Neither the insect nor the mammal used it because they discovered that it might be made serviceable—they used it because they had to use it—there was no option to be exercised.

And there was another invention connected with it in both cases. The tube thus fortified against collapse was a breathing tube, and the air-currents might carry into it a dangerous quantity of fine dust: so the insect's attenuated tube was barricaded with a dense chevaux-de-frises of microscopic hairs extending across it in every direction; and man's nostrils were guarded by coarser hairs.

If any intelligent person would like to be satisfied, once for all, as to the reality of Divine contrivance in the works of nature, let him consider carefully the construction and operation of two great tubes that are found in the bodies of man and the other superior animals, and then forever dismiss all further doubt on the subject.

These two great tubes are the gullet (esophagus) and the windpipe (trachea). One extends from the throat to the stomach, for the purpose of furnishing a passage for the conveyance of food. In man, it is about nine or ten inches in length and averages about an inch in diameter. The other extends from the throat to the lungs, to furnish an air-conduit. In man, it is about four and a half inches in length, and about an inch in diameter, and extends downward directly in front of the upper portion of the gullet, with which it is in contact.

In construction, the gullet is a soft collapsible muscular tube, having, as already stated, two sets of muscle-fibres, those of one set extending longitudinally, and those of the other set arranged circumferentially, of the tube. It is these circumferential fibres that contract successively in waves to force the food down into the stomach as already described. The two pneumogastric nerves descend in close contact and spread out around its walls, conveying undoubtedly the motive force which excites its peristaltic action. Without that action, the animal would not get the food from the mouth into the stomach.

The windpipe, in man, is composed of imperfect cartilaginous rings, connected with each other by fibrous membrane, and is provided with muscular fibres, mucous membrane, and glands. The muscular fibres are disposed in two layers, one running longitudinally, and the other transversely, of the tube. The glands furnish a secretion which serves to lubricate the inner surface of the tube. The cartilaginous rings, from sixteen to twenty in number, are imperfect in that they do not extend entirely around the tube, but, at its rear side where it is in contact with the gullet, become thinned out into a mere connecting membrane—a form of structure in which the rings at all times keep the tube free for the passage of air through it, but at the same time the flexibility of its rear wall prevents it from exerting a pressure against the gullet that might obstruct the passage of food through the latter.

Now pause for a while to reflect upon the remarkable differences between these two contiguous tubes, each exactly adapted to the performance of its own function and totally useless for that of the other. Without the peristaltic action of the one, or the imperfect cartilaginous reinforcing-rings of the other, no large land-animal could survive. It needs no argument to show that these are specific and ingenious contrivances designed and carefully adapted to perform their specific functions. Nor does it need any argument to show that no law of Evolution can account for the differences of construction and operation found in these two adjacent tubes.

CHAPTER X.

The Glands.

When nature desires a substance for any special use, she experiences no difficulty in providing it; and yet she has to be extremely particular as to the chemical composition of every substance employed by her, for the reason that any mistake in her formulæ, or carelessness in compounding her materials, might be fatal to life. She therefore prefers to construct and operate her own chemical factories, so that she may be absolutely sure that they will be perfectly adapted to her requirements, and that no mistake or carelessness will ever occur in their operation. She needs a vast number and variety of peculiar substances for her work of building up and caring-for the animal structure; and for the manufacture of each one of them she establishes a special factory or system of factories adapted to the purpose. These chemical factories are by the scientists named *glands.*

A gland is defined, anatomically, as "a soft granular organ of the body, consisting of a congeries of blood-vessels, nerves, and a peculiar tissue." That is not much of a definition or description, as we shall have occasion to see; but is better than none, and is good as far as it goes. Undoubtedly, a clear idea of the visible characteristics of a gland can be communicated more readily by pictorial than by verbal description; as the accompanying illustrations of a few glands selected from the countless millions found in the human system will make manifest. In fig. 9 is represented a vertical section of a small portion of the skin (as seen through the microscope) containing several sweat-glands *a*, and two or more oil glands *b*, each communicating, by means of tubular conduits, with the surface of the skin, as shown at *a'b'*, respectively. It will be observed that the sweat-glands, at the bottom of the conduits or pores, are constructed in the form of minute loosely-coiled tubes, which lie deeper in the skin than do the oil-glands; and that the latter are constructed on a

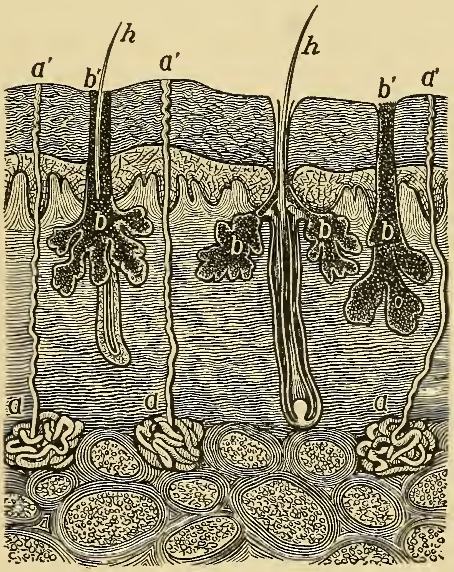

Fig. 9. Sweat Glands and Oil Glands.

very different plan and provided with a larger discharge-conduit, which in many instances, extends to, and surrounds, a shaft of hair growing from a root more deeply buried in the skin. All these glands are supplied with nerve-fibers and nutritive capillaries too minute to appear in the cut.

These several different forms of gland (and countless others) have been created through the agency of the "forces of nature," and for very dissimilar purposes. The office of the coiled sweat-glands is to extract saline water from the lymph and blood, and force it to the surface of the skin to cool the heated body by evaporation. The office of the leaf-shaped oil-glands is to *manufacture* an oil from materials brought by the blood and lymph and to discharge it upon the surface of the skin and hair to keep the latter in proper condition. It is unnecessary to say that, to extract salt water from blood and lymph, where it always exists, and to manufacture by chemical processes hair-oil from blood and lymph where it never exists, are two entirely different things, the former being a mere filtering operation, and the latter a true chemical manufacture. Observe that nature obliges the blood and lymph to transport to a certain spot materials for building a filtering-establishment, and also to build it out of those materials, and there to equip it with every appliance necessary for its filtering work; and that she obliges the same blood and lymph not only to transport to another certain spot in the same neighborhood materials for building a particular kind of chemical-factory, but also to build and equip that factory for its special business; and then, both establishments having been completed, she obliges the blood and lymph to supply them for perhaps the next fifty, sixty, or a hundred years, with the "raw materials" necessary for their daily business. This is not one of the "fairy tales of science" spoken of by the poet, but is the simple plain statement of well-known facts which every intelligent person can easily verify for himself if he will take the slight trouble to do it. He already has been long familiar with the nature of the soft oil and saltish water supplied to the skin by the pores, and with the utility of such supply. With a microscope and a shred of human skin, he can see the pores and the glands and examine them at his leisure. He knows that the little glands must have been formed out of materials brought to the spot by the circulation, and that they are forming or extracting their dissimilar products from materials brought to them by the same circulation. And, finally, he sees that the two kinds of glands are not of the same form; and reason tells him that they must differ materially in their internal construction, or one of them would not always make hair-oil, and the other always extract salt water, from the same blood or lymph. In short, he is able to obtain for himself all the information concerning these two glands that could be given in a learned lecture by the greatest scientist in the world.

But one thing neither he nor the great scientist will ever be able to explain; and that is, how the blood or lymph, or any other unthinking substance not possessiong even the rudiments of a mind, can manifest the superlative intelligence necessarily implied and actually exhibited in the plan and construction of these two little glands—how any such substance could realize the desirability of bathing and oiling the skin and hair; could know how to construct and equip an automatic bathing-apparatus suitable for the purpose; and could possess that perfect knowledge of the nature of the primary elements and of the laws of chemistry that beyond all question was indispensable to render possible or even conceivable the building of an oil-factory adapted to select from blood or lymph the elements which when chemically combined together would become an oil, and not only adapted to select them but also to combine them together in exactly the right proportions for the purpose—that is the thing of which we look in vain to science for an explanation. To attempt to explain it by attributing inventive intelligence to the lymph, blood, and circulation-vessels themselves, is to attribute to them the possession of a mind superior to that of the man of whose physical body they form a very small part—is to assume that an almost infinitesimal fraction is greater than the whole, which is a mathematical and physical absurdity. On the other hand, to attempt to explain it *without* attributing to them the possession of mind, is to assume a miracle—and not only one miracle but millions of them; for there are in the human body millions of these oil-glands, and millions of other glands even more wonderful than they. There is no escape from the necessity of assuming the action of a mind existing *somewhere,* as the true explanation of these astonishing facts. That mind, which planned and directed the construction and mode of action under consideration, does not exist in the physical tissues, nor in the blood and lymph, nor anywhere in the man himself, but *somewhere else.* Where, then, is it!

Now, if we were treading on *metaphysical* ground there might be danger of error in our conclusions; for metaphysics, as admitted by Kant, one of the greatest of all metaphysicians, contributes to the establishment of true theories nothing but the criticism and destruction of false ones. But here we are dealing not with metaphysical speculation but with facts; and the unquestionable facts absolutely necessitate the conclusion at which we have arrived. Where, then, *is* the mind that controls and directs the forces of nature; that created and organized the glands; that set the adrenals at work to furnish an effective stimulant, the absence of which would be fatal to mammalian existence; that endowed the pyloric valve with the ability to distinguish between foods fully prepared, and foods half-prepared, for the action of the digestive fluids; that created and organized the spider's wonderful spinning-apparatus, the defensive weapons of the snake and the bee, the scientifically-constructed optical instruments so generously furnished even to the humble house-fly; and the many other inventions to which we have referred or shall hereafter have occasion to mention?

From the same blood and lymph from which the oil-glands manufacture oil, the mammary glands manufacture milk, the salivary and gastric glands secrete fluids that assist in preparing the food for digestion and even have themselves a digestive action upon certain foods, the pancreas and liver create more-powerful digestive fluids, the tear-glands produce a briny eye-water, the glands or membranes of every movable joint manufacture an exquisite lubricating-oil, the glands of the ear manufacture ear-wax, the glands of the chin and axilla manufacture butyric acid, and many other glands, including those of the reproductive organs, the parathyroid glands, the supra-renal glands, and the lymphatic glands, manufacture or secrete various other substances of totally dissimilar character —more than a dozen different kinds of factories, equipped with different machinery, and manufacturing from the same "raw material" many substances that possess characteristics of structure and quality totally unlike. The products themselves do not, as a rule, exist in the blood (where some of them would be fatal to life or health), but their elements, carbon, hydrogen, oxygen, nitrogen, phosphorus, iron, etc., exist there in other and different combinations. The mechanisms of the various glands decompose these other combinations so as to get at the elements separately, and then, by synthesis, recompose them into the different new combinations required. And the engineer who constructs these factories never makes a blunder—never locates a bile-factory in the knee, nor an oil-factory in the eye, but puts each exactly where it should be, and equips it with exactly the machinery necessary for its predetermined work.

Now, the facts above stated, that all these glands are built up from the blood and lymph, and that after they have been completed some of them are found to be filtration plants, and others to be chemical factories capable of manufacturing important products out of the crude materials brought to them by the blood or lymph, cannot be questioned: and it remains only to indicate the conclusion which necessarily follows from these premises.

Through the universal observation and experience of several thousand millions of human beings during the last five thousand years, mankind has come to know one fact with what may fairly be called absolute certainty, namely, that mere matter is incapable of contriving, inventing, thinking, or knowing. We see it change position when associated with or controlled by something that we call force, and of which we know nothing further than that it is capable of compelling matter to change position; and we see two or more portions of it change their relative positions and take up new positions in which they can coöperate with each other to produce certain results, when associated with or controlled by something which we call mind, and which we distinguish from force by its ability to form designs for the accomplishment of various specific results and to compel matter to readjust itself so as to carry them into execution. Hence, when we see matter arrange itself into the complicated structures above described, and for the definite purposes clearly indicated by the results affected by those structures, we know that both matter and force have been acting, in these particular instances, under the control and guidance of mind. Any person who challenges the correctness of this conclusion will find himself not only obliged to contradict the unanimous experience and judgment of mankind, but also to destroy the basis of his own reasoning by denying the authority of reason. The inevitable conclusion is therefore that these gland-structures were brought into existence by the forces of nature, acting under the guidance and control of mind. Within the range of human knowledge and experience, such things do not happen by chance, but only by design.

Suppose that a person possessing unlimited financial means and a knowledge of all the science of the world should undertake to manufacture any one of the substances above referred to, for example, hair-oil, from animal blood; how would he go about it? Science knows no process by which it can be done; and he would not be able even to form a preliminary plan of his proposed factory. Suppose, further, that he should be required to construct his factory itself from materials derived from animal blood; how impossible would be his task! And yet, that is exactly what has been done in the animal body. The secret is in the construction of the factory—a little gland whose dimensions are often so small that a microscope is required to make it visible. Its machinery must be of exquisite perfection; it would seem that the accidental displacement of a single molecule would throw it hopelessly out of gear. But near it is another chemical-factory, of similar dimensions but of different construction and equipment, for it is designed to manufacture from the same blood a substance totally unlike hair-oil—not even oil at all.

Scientific writers pass over these amazing things with exasperating nonchalance; they seem to think that when they call a chemical-factory a "gland," and tell us what it manufactures, no further explanation is necessary. But that is no explanation at all; it leaves the difficulty untouched. What we desire to know is, how that particular gland became constructed and equipped to manufacture precisely the complex and peculiar substance needed at that particular spot; and how, at another spot where a different substance is needed, a gland is always found constructed and adapted to manufacture that other very different substance. The scientist personally knows no more about the construction and operation of that machinery than does the dog, the horse, or the ignorant savage in whose body it exists. When we state that we know the location of the several glands, their external appearance as seen through the microscope, their connection with nerves and minute blood-vessels, the different products which they secrete, and some of the uses that man and nature make of these products, we state everything that is known about glands, and probably all that ever will be known.

An invention or discovery—oleo-margarin—made by a scientist about forty years ago, affords an excellent illustration of the processes of nature and the intelligence and skill required to imitate them. The second empire was then at the height of its glory; and the empress, Eugénie, desiring to confirm it in the affections of the people, gave her personal attention to the food-supply of the poor. Visiting their humble kitchens for purposes of investigation, she found that they were interdicted from the use of *butter* by reason of its scarcity—could not some substitute be discovered or invented which would take the place of butter in the dwellings of the poor? She sent for a distinguished physiologist, M. Hypolite Mège, and communicated to him her idea. He thought that the project might be feasible; and she instructed him to make the attempt, at her expense, and placed under his control one of the imperial farms, on which were several hundred cows, in order that he might discover how they produced their butter, and, if possible, imitate the process. After a year of investigation and experiment, he came to the conclusion that the cow manufactured her butter from her fat, and that it was possible that the process might be substantially reproduced by artificial means. Analyzing cow's fat and milk, he found that the former was composed of three oils, oleine, margarin and stearine, and that milk was composed of the same relative proportions of oleine and margarin, with a certain proportion of casein (the element that enables milk to make cheese) and with a trace of butyric acid (the element that gives butter its peculiar flavor) and a considerable quantity of water, which is unnecessary to the production of butter. He therefore concluded that, as the cow's mammary glands evidently separated the stearine from the oleine and margarin, his artificial process must begin by making a similar separation. By heating the three oils together up to the cow's normal temperature (103° Fahrenheit) and then allowing the mixture to cool slowly without disturbance, he ascertained that the stearine would become solidified when the temperature fell to about 80° Fahrenheit, while the oleine and margarin would remain liquid, so that, by simply straining the mixture at or about that temperature, a complete separation of the stearine from the other two oils would be effected. He had now all the elements necessary for making butter except the coagulating casein and the flavoring butyric acid. Science did not know how to produce these substances, and does not yet know: but the cow did it, and so he turned again to her for information. After much study, he concluded that she produces those two substances somehow during the digestion of her food in the stomach and sends them directly to the mammary glands, where they join the oleine and margarin after the stearine has been separated out. Here was a grave difficulty—art could not produce the two substances, and butter could not be made without them. At last it occurred to him that, by taking that part of a calf's stomach called the rennet, which is used in the manufacture of cheese, and subjecting the oleine and margarin oils to its action, he might possibly get the solidifying and flavoring effects which he desired. The experiment succeeded; and from that time the public has been supplied with cheap and wholesome butter, of precisely the same chemical composition as natural butter and in every respect as good when made with proper care. A few years afterward, another French savant simplified and further cheapened the process by omitting the rennet, adding to the oleine and margarin about ten per cent of cow's milk, and churning them up together. Never did science achieve a greater triumph than in the production of oleo-margarin butter.

But, for us, the conspicuous lesson to be learned from Professor Mège's discovery or invention is, that science, with its resources, and with the utmost effort, was utterly unable to produce the chemical substances which are required for the manufacture of butter. It cannot make an ounce of fat, or of casein, or of butyric acid. The cow makes all of them, but without knowing how, or even that they are made. She makes them because the Creator has given her the machinery for making them, and obliged her to use it. Of the construction and mode of operation of the mammary glands, or any of the fifteen or twenty million glands in our own bodies, we are as ignorant as the cow is. Science cannot make, artificially, a single one of their products. Its only boast is, that it has discovered that they are made, *somehow,* through the action of what we call glands. And yet some persons who call themselves scientists have the temerity to sit in judgment upon the works of the Creator, and even to question His existence!

There are about fourteen hundred sweat-glands to each square inch of the human body—so that the total number reaches several millions in a man of average size. The number of oil-glands is approximately as great. All these glands are entirely independent of each other—no one propagates its species, but each is constructed separately. There is no evidence that they have been formed by the variation of preëxisting structures, or that there were any preëxisting structures to vary. It is, therefore, evident that the Darwinian Theory affords no explanation of their origin.

Scientific treatises inform us that physical matter is composed of molecules each of which is not larger than one 1,250,000 of an inch in any of its dimensions; and that each molecule is composed of atoms a thousand times as small as itself. It follows that a gland one one-hundredth of an inch in dimensions contains nearly two trillions of molecules, or two quadrillions of atoms, of the various elements of physical matter. The complexity of structure in these molecules and atoms transcends the power of the imagination to conceive. In a lecture before the science department of Columbia University, October 23, 1907, Professor Ernest Fox Nichols, of that university,[1] attempts to convey some faint idea of it in the following words:

"The extreme complexity of the material atom is strikingly shown by the light from incandescent gases and vapors. When examined by the spectroscope the single element iron exhibits hundreds of definitely placed bright lines in the visible spectrum alone, which means the iron atom must be capable of vibrating in hundreds of different periods. No single atom need be vibrating in all these ways at the same instant, but if all iron atoms are alike, and we have every reason to believe they are, whether shining on earth or in the stars, then every atom of iron must be capable of swinging or bounding, revolving or shuddering, or doing something in all these ways.

"Before the evidence of the spectroscope the older idea of the atom as a simple structureless body falls to the ground. The complexity of a grand piano seems simple in comparison with the iron atom. But spectroscopic evidence does not end

[1] Now President of Dartmouth College.

here, but indicates *what* it is in the atom which does something and *how* it does it.

"Ten years ago Professor Zeeman placed a sodium flame between the poles of a powerful electro-magnet and examined its light by the spectroscope. He observed the most striking and peculiar effects of the magnetic force on the character of the light. The time is too far gone to permit a description of what the effects were, but the light sent out by the flame showed exactly the characteristics which magnetic force would produce, provided the light came from atoms inside which minute electric charges were rapidly revolving. It was even possible to compute the ratio of charge to mass for these revolving mites. The ratio revealed was that previously obtained for the cathode particle. . . .

"It had long been known that hints about the internal fabric of the atom would be most effectively sought with the spectroscope, but we have here gained at a single bound the most amazing insight into a most complex system."

When we reflect that each gland contains quadrillions of these infinitesimal atoms and molecules, not of iron alone, but of every substance that enters into the animal body, I think that no person possessing even the rudiments of reason can doubt that it required *intelligence* to arrange these billions of molecules, at a spot where hair-oil is needed, in such relation to each other that they would coöperate to manufacture hair-oil from the animal's blood; in another spot, where bile is needed, to arrange them in such relation that from the same blood they would manufacture bile; in a third spot, to arrange them so that from the same blood they would produce gastric juice; and so on for all the various substances elaborated from the blood by glands; and never to make any mistake about it! How did that superhuman intelligence discover that when arranged in a certain relation they would produce one of these substances, in another relation another, in a third, another, and so on through the entire list? How did it contrive to compel them to assume the exact relation required at each spot to produce the particular product there wanted? It is idle to prate of *evolution* as having anything to do with it; for no known law of evolution has the slightest relevancy to the facts. There is but one explanation conceivable to my mind, and that is that, in the beginning of things, the Creator established laws which constrained the physical forces to build a universe, and the life force, acting in conjunction with the physical forces, to people it with the forms which have since inhabited it. In this view, the countless atoms and molecules that constitute the living body assume their respective positions and relations in obedience to a law that is "deeper and more far-reaching than the laws of evolution"—a law that is not dependent upon the action of the environment, not enforced by natural selection, and not limited to the modification of preëxisting structures. Unless we assume the existence of such a law, breathed into the living being with the life-force itself, there is no escape from the miracle of the special creation of each gland; for they exist, exhibit conclusive proofs of creative intelligence, and cannot be accounted for on any other theory.

Closely analogous to the gland in function, though not in structure, are the bone forming *cells* (1) of the periosteum (2) and endosteum (3), by which the bones of the skeleton are constructed. To render their action intelligible to the ordinary reader, it will first be necessary briefly to describe the structure of a bone; and I will take for illustrative pur-

[1] These cells are called *osteoblasts.*
[2] *Peri,* around, and *osteum,* bone.
[3] *Endon,* within, and *osteum.*

poses the thigh bone (femur) of the human being. This bone is tubular in form, with enlarged solid or closed ends adapted to articulate with the bones immediately above and below it; and its central cavity is filled with marrow. The periosteum is a layer of cellular substance surrounding the bone except at its ends; and the endosteum is a layer of similar substance lining the central cavity. The bone is exceedingly hard in the immediate neighborhood of the periosteum and endosteum, but in other regions is of less density and hardness. To the naked eye, the walls of the hollow structure appear to be absolutely solid, but under the microscope, innumerable minute passages are seen, extending from the outer surface into or through the substance of the bone. Some of these passages are occupied with blood-vessels or lymphatics connecting with the general circulation, and into others the periosteum has sent minute fibres of its own substance. Minute arteries and veins also extend into or through the terminal enlargements of the bone and connect with the general circulatory system. Fully completed bone consists of organic matter (about 31 parts) and inorganic matter (about 69 parts, of which five-sixths are phosphate of lime).

In the early stages of embryonic development, the future skeleton is represented by a temporary structure composed of cartilage. The latter is made up of cartilage-cells embedded in a soft material termed the matrix, and is consequently weak, yielding easily to pressure, and totally unfit to perform the functions of a supporting skeleton. Nature therefore makes arrangements for exchanging the temporary cartilage for some firm substance capable of sustaining the weight of the body, holding its organs in their proper relative positions, and protecting from injury such of them (for example, the brain, heart and lungs) as would be most seriously affected by any accidental pressure or contusion. The work of exchanging temporary and yielding cartilage for permanent and rigid bone is performed in the manner which will now be described.

As if to prepare for the coming operation and to facilitate its performance, the cartilage cells increase in size and arrange themselves in parallel rows, whilst the matter increases in quantity and pushes the parallel rows further apart. Millions of bone-forming cells called osteoblasts (created by some unknown means from the blood or lymph) now take their position on the surface of the cartilage, enveloping it as with a sheath (except at the places where the joints are to appear, which places they leave undisturbed); and many of them follow the blood and lymph into the interior of the cartilage, where they station themselves along the margins of the blood and lymph streams. Each of these little cells is an accomplished chemist and a practical stone-mason. As a chemist, it is able to detect any earthy minerals, such as phosphate of lime, carbonate of lime, fluoride of lime, chloride of sodium, or phosphate of magnesium, that may be borne along by the stream, and to separate them from the moving liquid, and employ them for the manufacture of bone; whilst, as a stone-mason, it takes the hard material, and builds it up into solid walls by laying one piece on another as the bricklayer builds up the walls of a house. The workmen at the surface of the cartilage thus construct a stratum of bone around it, while those in the interior erect walls of bone that divide the cartilage into minute masses separated from each other and isolated from the sources of nutriment, and leave it to wither and perish for want of sustenance.

The cartilage has now become removed, except at the ends of the bone, and bony matter has taken its place, occupying the entire space enclosed within the surrounding periosteum. And now a corps of assistant cells appears on the ground—larger cells, and of a different form, called *osteoclasts*—whose business is not to *form* bone, but to *destroy* it. They proceed to excavate the central region of the bone in order to hollow out a large chamber to receive the marrow. This chamber extends from one end-cartilage to the other, and converts the bone into a tube with its ends closed. Bone-forming cells (osteoblasts) now resume their work, this time along the walls of the central chamber, which they solidify and strengthen as they before solidified and strengthened the outer walls of the bone. Some of the osteoclasts work their way through this hard stratum, and proceed to bore holes through the walls already erected by the osteoblasts in the region between the two hard strata. These holes allow of communication between the minute spaces (areolæ and lacunæ) enclosed by said walls, and in these lines of communication blood-vessels and lymphatic-vessels make their appearance and connect with the general circulation.

Around the bone thus formed, the periosteum continues to build up the hard structure until it has attained the thickness and strength necessary for adult life. The cartilaginous ends of the bone are gradually pushed further and further apart by the deposit of new bone behind them, and are partially absorbed or destroyed, leaving only a thin coating of cartilage on the ends of the bone.

The flat non-tubular bones, such as the shoulder blades and ileum, are built up in a somewhat different manner. Instead of cartilage, a membranous tissue marks the place of the future bone. Osteoblasts develop the surface of the membrane into a periosteum, and the connective fibres into bone, and continue their work by adding fresh layers of bone until the structure has attained the required thickness and strength. Osteoclasts are not employed in the construction of these flat bones, which have no marrow-chamber.

The process employed by nature in forming the bones of the skeleton has become known through innumerable post-mortem examinations of the human foetus in all stages of its development, and of infants in whom the metamorphosis of cartilage into bone had not been completed before their death. Every step of the process has been studied and verified again and again, and a full description of them all can be found in the standard works on physiology and anatomy. See, for example, Gray's Anatomy, pp. 44 to 47, and Kirk's Handbook of Physiology, pp. 48, 49.

Nothing could demonstrate more plainly and unmistakably the action of creative design than does the human skeleton. Its history is not the history of a *growth,* but of a consecutive series of separate and independent acts of *construction.* Growth does not suffice to explain the sequence of events that we there witness. *First,* there is formed, by the usual process of growth and development, the temporary model of a skeleton, composed, in parts, of cartilage, and, in other and separate parts, of membrane. This model is evidently for the purpose of determining the relative arrangement and specific forms of the future bones; holding their place until they should appear, and serving meanwhile as a partial support for the softer surrounding tissues while the latter are forming. Next, the temporary structure is discarded and a permanent structure of hard bone takes its place—takes that place *not by a process of growth from the preceding structure,* but by an act of substitution. In fossilization, we behold dead wood or bone transformed in water into stone by electric action, which slowly effects the exchange, atom by atom, or molecule by molecule. Nature employs no such method when transforming living cartilage or membrane into living bone; but she summons an army of osteoblasts to do the work of exchanging the old substance for the new, and then an army of osteoclasts to bore out certain of the new bones to fit them for their future office This is not a process of growth, but a process of construction. Nature here takes a flying leap from one process to another—abandoning the old method and creating and adopting a new one. This break in continuity cannot be accounted for on any theory of evolution. It is an abrupt change from an old form to a new form—a change not brought about by successive slight modifications of the original form, but by the introduction of a new principle of construction. The evolutionist endeavors to account for the conversion of the reptile into the mammal by assuming it to have been the result of slight modifications of the reptilian form succeeding one another for thousands of years until the transformation was finally completed. That theory sounded plausible, in the absence of more definite information. But here, in the human skeleton, a transformation is effected that is quite as remarkable; and we see, and therefore *know,* that it is caused by the action of millions of little osteoblasts and osteoclasts, which nature sets at work for the purpose. How can anybody be sure that the metamorphosis of reptile into mammal was not effected by analogous means?

It is surely unnecessary to spend much time in arguing that the operations of the osteoblasts and osteoclasts can be accounted for on no other theory than that of their guidance by a great creative intelligence. It cannot be assumed that they are rational thinking creatures, familiar with the Creator's predetermined plans, and intelligently devoting their brief existence to the work of carrying those plans into effect. It cannot be assumed that the osteoblasts understand why the periosteum is not to be extended over the end-cartilages at the joints; nor that the osteoclasts (who work inside of the bone) understand the purpose of the chambers and passages which they are excavating, and therefore know the necessary dimensions and direction which those chambers and passages must have. It cannot even be conceived that they work intelligently at all, but only that they do their work in obedience to a blind impulse which they are powerless to resist. But there is a guiding intelligence *somewhere,* which controls and directs all their operations. The marks of design are apparent throughout.

Darwin's evolutionary hypothesis is absolutely unable to account for the osteoblasts and osteoclasts, or for the astonishing intelligence by which they are obviously directed. The osteoblasts are wanted, to make bone, and the osteoclasts are wanted, to destroy bone; and they appear where they are wanted, armed with these inexplicably opposite powers—that is all that science knows of them, or ever will know, except that each of them is composed of thousands of molecules organized in the osteoblasts in such a manner as to enable them to make bone, and in the osteoclasts in such a manner as to enable them to destroy bone. What is the mode of organization necessary for either purpose, is wholly unknown and undoubtedly unknowable to man.

Only one conclusion is possible from these facts; and that is, that the Designer who controls the forces of nature and employs them to execute His designs, planned the marrow-bones and the flat bones in advance of their construction, and, in doing so, exercised a deliberate *choice* of expedients adapted to His two different plans. Who directed the bone-destroyers to the marrow-bones, and forbade their access to the flat bones? Who told them what chambers and passages to hollow out? Who prohibited them from exercising their destructive powers any further than was necessary for the completion of their specified work? Their nature and function being to destroy bone, why do they not go on with the work of destruction till there is no more bone left? It is as clear as day that the whole thing is under the direction of intelligence, and along the lines of a predetermined plan.

The fact that what happens in thus forming the bones of man, happens in forming the bones of all the other millions of mammalian animals in the world, shows that chance has nothing to do with it. Nor is any blind force of evolution able to account for it. When one attempts to apply Darwin's theory of evolution to the osteoclasts, the effort totally breaks down; for there were no pre-existing structures from which to produce them by the process of modification; no environment conceivably capable of modifying such hypothetically-necessary preceding structures; and there is no theory upon which we can account for their disappearance when their work is completed. All that is known about them has already been stated. They did not appear in the body until hollow bones were wanted; then they appeared, performed their work, and disappeared.

This brings me to a further general reflection concerning the Darwinian theory. While that theory appears measurably to account for the external modifications of the body as a whole, it does not explain modifications of its internal parts. There is no conceivable explanation of how a cell or gland constructed to perform one function can become modified so as to perform another and very different function. All such things as these are left in the dark.

CHAPTER XI.

The Human Skeleton.

Paley, in his *Natural Theology,* has admirably discussed the structure of the skeleton, calling attention to the many evidences of intelligent contrivance and adaptation displayed in its plan and construction. Recommending the reader to familiarize himself with Paley's argument, I shall, however, adhere to my original plan of confining this discussion to those matters in which the proof of creative design is as unanswerable as a mathematical demonstration.

And here I may be allowed to remark that whilst, for solving mathematical questions, demonstration is the highest conceivable order of proof, yet, for solving many other questions, there is an order of proof equally as high. In the last analysis, all proof, whether mathematical or not, is based solely upon reason and universal observation and experience. Hence while, from the nature of the subject, mathematical demonstration cannot be employed to prove the existence of creative design, yet (and also from the nature of the subject) creative design may, in many cases, be proved with absolute certainty. For example, if I should discover floating about on the water an artistically-constructed boat equipped with masts, sails, rudder and seats, its inherent proof of design could not be overthrown or even weakened by all the evidence and scientific theories in the world. It would be as easy to make an intelligent being believe that 2 plus 2 equals 5, as to convince him that such a structure came into existence by chance or by "spontaneous generation."

We have already considered many instances in which the proof of creative design is as clear and unanswerable as it would be in the case of the boat. That is to say, we have seen the existence of an intelligent Creator proved by evidence that has a convincing force equal to that of a mathematical demonstration. After such proof, to disbelieve, question, or doubt, His existence would be simply self-stultification; insanity itself, or complete mental imbecility, could go no further.

The human skeleton presents numerous details of construction in which the evidence of creative design cannot fail to be conclusive to any reasoning mind. The cranium, or brain-case of the skeleton, exhibits one of them. The cranium, a thin, marrowless bony structure, is composed of an inner and outer layer (termed tables) connected by spongy osseous tissue. The outer layer is hard and tough; the inner layer (called the *vitreous* table) is thinner, denser and more brittle than the outer layer or table. The domelike top of the skull is the best possible form of resisting external pressure; and it is made up of several parts, divided from each other along irregular lines called *sutures,* in which there is interposed between the naked edges of bone a thin strip of elastic membrane. This mode of construction, that is to say, making the skull in several parts divided from one another by thin lines of elastic substance, is admirably adapted to allow the brain and skull to increase in size during the period of youth, besides protecting both, so far as practicable, from injurious shocks and jars.

1. But it is to the peculiar formation of the edges of these several bony parts that I wish to invite particular attention; for the proximate edges of the outer tables are formed by rows of closely interlocking *saw teeth,* as shown in the cut. No man can look at this peculiarity of structure without being

impressed with the conviction of its obvious design. Even if he did not know that it has been for ages a common expedient in carpentry and masonry, he could not fail instantly to see its significance in the skull. In the animal system, there are no other joints constructed on the same mechanical principle, and no other occasion for any such construction. But here, in this box, is enclosed the most important organ of the body, a soft and exceedingly delicate organ in which the displacement or injury of a single microscopic cell might work irretrievable ruin to the entire physical organization:

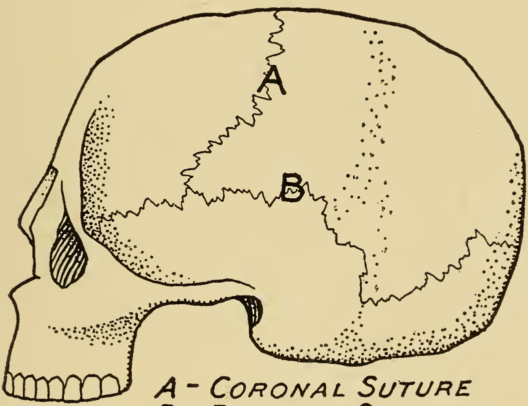

Fig. 10. Side view of cranium.

and to complicate the problem of construction, the walls of the box must be made thin ([1]), and of several pieces not so rigidly joined together as to interfere with the growth of the brain, and not so loosely joined together as to be liable to accidental dislocation. Moreover, it was inevitable that the box should occasionally be subjected to violent strains.

[1] The average thickness of the skull is about one-fifth of an inch.

In all animals that stand erect, its position, at the upper end of the body, exposes it to accidental contusions, and to a violent blow in case the animal should stumble or be thrown down. All these things had to be considered, and a construction contrived that would reduce the danger of fatal accident to a minimum. The construction that was adopted has been found to answer its various purposes admirably.

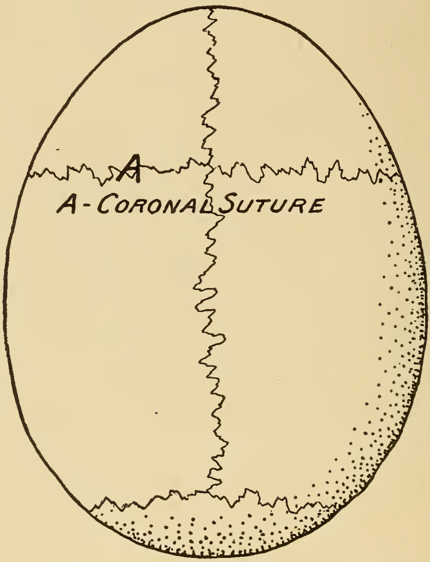

Fig. 10A. Top view of cranium.

It is seldom that the brain is severely injured except in cases where the tables of the skull are crushed or broken and driven inward against it. The arched shape of the skull, the elastic scalp that covers it, and the connecting membrane at the sutures, prevent the several pieces from lateral (that is, inward or outward) displacement, and the interlocking serrations render it impossible that one piece should slip lengthwise upon another.

Now, the existence of these serrations or saw-teeth cannot be accounted for on any theory of evolution. We see by examination of the other bony structures of the skeleton, that bone does not naturally tend to form its edges with saw-teeth, but, on the contrary, to form them smooth and regular. Here, then, in the skull, is an exceptional case of bone formation—a case which *opposes* a known law of nature. In this fact, Darwin's fundamental hypothesis of progressive modification encounters an insuperable obstacle. For, if these skull-bones had originally been formed with smooth edges, like the other bones of the skeleton, they would, in obedience to the general law, have remained smooth; and if they were originally formed with serrated edges, the serrations, being a totally new feature in bone-construction, were not due to evolution or progressive modification, but to creative design, as their highly-artificial construction indicates. In either event, the first appearance of these interlocking saw-teeth can be accounted for only on the hypothesis that nature took a flying leap from the old to the new—a hypothesis which is absolutely fatal to the universal applicability of Darwin's Theory of Evolution; for it plainly implies the existence of some unknown cause, "deeper and more far-reaching than the laws of Evolution," and able to overrule a law of nature by directing an exceptional construction in the case of the skull-bones. The obvious utility of this exceptional construction in the place where it occurs cannot fail to impress the mind strongly with the idea that it was formed by design. In fact, in exploring the works of nature, that idea forces itself upon us so often that when scientific writers in the different departments of biology inadvertently make use of expressions indicating that such and such an organ, form, or plan of construction, was for such and such a *purpose,* we accept the statement as obvious fact, without even thinking of its bearing upon theology—which, in most instances, is undoubtedly true of the writers themselves.

2. Further examining the serrations of the cranial bones, we find that they occur only in the outer tables, composed of compact, tough material—never in the inner tables, thinner and composed of brittle and frangible bone, nor in the spongy material between the two tables. The inner tables are formed with smooth regular edges. Now, why this difference between the outer and inner layers *of the same bone?* A moment's consideration not only supplies the answer, but forces still more strongly upon us the idea of creative design. The inner table is too brittle and thin and the intervening spongy material too weak, to support such serrations. If formed upon the inner layers, they would prove an element of danger rather than of safety; for if they should crumble or break, their fragments would be liable to penetrate the brain and cause irremediable mischief. Cases have happened in which a blow delivered against the skull has left the outer table unharmed but has fractured the inner table, depressing and driving inward portions of it ([1]).

3. Another plain indication of design in the construction of the skeleton, is seen in the way in which the ligaments (and some of the tendons) are attached directly to the bones—that is, not their mere *attachment* to the bones, but the method by which it is effected. The ligaments and tendons are of enormous tensile strength, able to resist the severe strains to which they are necessarily subjected in the acts of running, jumping, and lifting; and they require a proportionately strong attachment. The *muscles* are as a rule, fastened to the surface of the bones, to the enveloping

[1] Gray's *Anatomy,* p. 150.

periosteum, or even in some cases to the connecting cartilage. But no such union will answer for the ligaments—and accordingly we find their end-fibres separated from each other and inserted deeply within the very substance of the bone itself, from which it is impossible to detach them except with the knife. When Ravaillac was drawn and quartered for the murder of Henry IV, it is related that the power of four horses was unavailing to detach the limbs until after the ligaments had been cut. The engineers who construct suspension bridges sink the ends of their cables deep in the ground, fasten them to heavy weights, and load the weights with a superincumbent mass of iron, stone and earth, in order to secure a firm anchorage of the cables. This is practically parallel to the means which nature employs to anchor the connecting ligaments to the bones on either side of a movable joint. The courts call such things *inventions* when found in the works of man; is the evidence of design less conclusive when they are found in the works of nature?

4. The problem of supporting the head upon the upper end of the vertebral column in such manner as to permit it to be partially revolved on its supporting axis and to be rocked so as to turn the face upward or downward at any phase of its revolution, without producing the slightest injury to the soft and delicate substance of the spinal cord or any disturbance of its working connection to the brain, was, indeed, a difficult one; but how perfectly, and with what wonderful ingenuity, it was solved!

The horizontal or rotatory motion, and the vertical or rocking motion, each limited to about one-third of a circle, are brought about by means of two joints, namely, one (for the rotary movement), depending upon the turning of the first vertebra (atlas) upon the second or next lower vertebra (axis), and the other (for the rocking or nodding movement) depending upon the rocking of the skull upon the upper vertebra (atlas), upon which the base of the skull (the occipital bone) rests. The mechanical principle is a familiar one in the arts, being found in the swiveled gun, the rotary lifting-crane, the gimbal joint, etc. It proves the exercise of intelligent contrivance as positively as it is possible to prove such a thing. Its embodiment in a practically operative structure could not happen by chance, and cannot be intelligibly accounted for on any theory of evolution.

In the joint between the axis and atlas, upon which the head swings like a gate upon its hinges, the actual construction of a door-hinge is closely represented. There is the supporting lower member with its upwardly-projecting pintle. This part is incapable of rotation, being fixed to the jamb or door-post (the vertebral column). Then there is the rotary member of the hinge, attached to, and turning with the door (the head). This part is perforated to form a socket into which the pintle extends. But the door (head) might swing too far on its hinge, and damage result. To prevent this, it is provided with "sheets," like the sail of a yacht, which limit the extent of its swing in either direction. These sheets are two strong ligaments, which, from the resemblance of their action to that of a mechanical contrivance called a door-check, have become known as "check ligaments."

5. A door may be unhinged by lifting it so as to disconnect the socket from the pintle. This would be a serious defect in the vertebral hinge, causing many persons accidentally to "lose their heads" in a more literal sense than that in which the expression is figuratively used. But in the animal frame, accidents of that kind have been most effectively guarded against, by the provision of strong ligaments which not only connect the axis and atlas together but also

securely connect the skull to each of them; and by the muscles of the neck, which connect the skull and vertebræ to the upper part of the body. The construction is such that the skull is practically *never* dislocated from the atlas, and the dislocation of the atlas from the axis can be effected only by the application of extreme violence. Yet the movements of the head are perfectly free, and never produce the slightest compression upon the spinal cord, which extends up to the brain through all this complicated mechanism.

6. In this connection, it may be allowable to call attention again to the various "annular ligaments" or straps which are employed to hold the movable bones or the tendons in place at the joints, when under heavy strain. See, for example, the annular ligament at the ankle, which extends around the joint and tendons and holds the latter close to the skeleton, no matter how severe the strain that may tend to force them outward away from it. The ligament and tendons are well-lubricated at this point, so that in flexing the joint they slip without appreciable friction, and we are not even sensible of the presence of the ligament, until dissection reveals it.

Now, this ligament has no other function than to strap down the tendon so that it cannot swing outward in flexing the joint. It is, so to speak, a *garter* under which the tendon plays longitudinally back and forth without friction. In a pictorial representation of the anatomy of the wrist, where a similar construction occurs, it might be mistaken for a garter.

Can anybody explain to me how any blind "force of nature" could plan such a structure?

7. The construction and combination of the bones of the arm furnish conclusive evidences of creative design. The upper bone of the arm (the *humerus*) is articulated to

the shoulder-blade by a ball-and-socket joint, which permits it to swing in all directions. In the fore-arm, there is a long bone (the ulna), which is articulated to the humerus by a hinge-joint, that permits it to swing forward. Now, if the hand were articulated to the ulna, the construction would

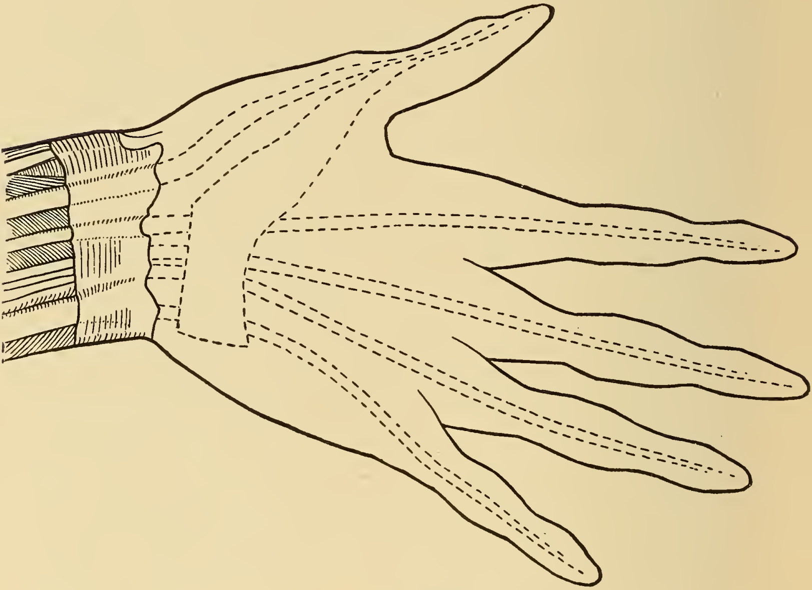

Fig. 11. Annular Ligament of Wrist.

be seriously defective by reason of the fact that the ulna does not rock, but only swings, on the elbow joint. Therefore the hand is articulated to another long bone (the radius), which is supported by, and rocks upon, the ulna, the two bones being tied together by straps of ligament at the wrist and just below the elbow, and by a strong ligamentous membrane between, which does not interfere with the rocking movement of the radius. Both bones are also secured to the humerus by strong ligaments which guard the elbow-joint against dislocation. All the joints and bear-

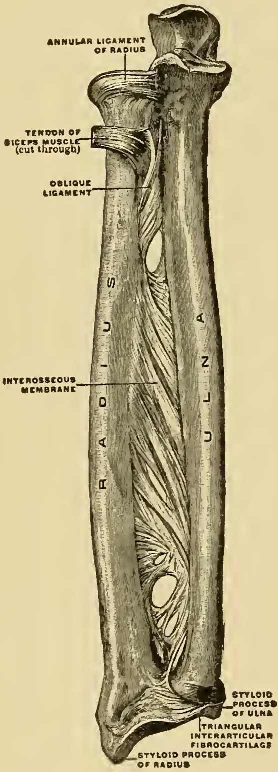

Fig. 12. Connecting Ligament of Radius and Ulna.

ings are kept well lubricated. This ingenious combination of bones, joints and ligaments was entirely for the benefit of the hand, and was designed to give it the admirable facility of movement with which everybody is familiar. He who cannot see in it conclusive evidence of intelligent contrivance must be mechanically blind.

I have not enumerated one-half of the particulars in which the skeleton, with its numerous and variously constructed arrangements of bones and ligaments, exhibits conclusive evidence of constructive design. But do we need any further proof of it? Really, it seems idle to pile up cumulative evidence to satisfy the unreasonable requirements of a mind which cannot be convinced by any amount of evidence. Take, for instance, the single example of the annular ligaments or straps, such as we find at the ankle, the elbow, the wrist, and (in a modified form) in the axis of the neck; what more can be wanted to meet the demands of the ultra-evolutionists? They are utterly unable to furnish any theory or argument which can account for the existence of those ligaments. The ligaments could not be formed by the action of the parts which they tie together or hold in place; they are constructed not by the force of any movement, but to *oppose* movement—to oppose force by force. A gate does not construct a pintle and socket upon which to swing; nor does a door construct a door-check to prevent it from swinging open too far, or a stream of liquid flowing in a tube construct a check-valve to prevent it from flowing in the wrong direction. These are conclusive proofs of constructive design. To argue that there is throughout all nature a life-force which constrains the cells to build up these structures, may be to argue correctly; but that life-force manifests intelligence and the possession of what we call mind, and is evidently the Creative force which we worship as God. To argue that each living cell has an independent life of its own, and that by virtue of that life they are able to coöperate with each other, for the building of these structures, is, in the first place, mere speculation and guess-work, and, in the second place, assumes for each cell an extent of knowledge, constructive skill, and power of organization, far superior to that of man himself. There is no reasonable theory but that of an intelligent Creator. To assume the existence of such a Creator may be, in the language of Haeckel, to assume a "miracle,"—but to assume that these things originated *without* a creator is to assume an unlimited number of miracles. A miracle is something contrary to, or inconsistent with, the laws of nature. Now, as an abstract question, we do not know, and cannot know, whether the assumed existence of God is inconsistent with the laws of nature or not; because, so far as we know, the laws of nature have nothing to do with the question. But there is a concrete question about which we *do* know something with absolute certainty, namely, we know that the existence of a contrivance without a contriver would be inconsistent with the laws of nature and so absurd as to be even unthinkable.

We have found all through the works of nature innumerable instances of contrivance and therefore innumerable conclusive proofs of a contriver. We have seen that that contriver cannot be the cells or glands, but must be some inscrutable intelligence, familiar with the laws of physics and chemistry, and the range of whose operations covers, at the least, the whole field occupied by nature. That infinite Intelligence can be no other than God. The existence of God, thus proved conclusively by the works of nature, cannot be inconsistent with the laws of nature. The assumed non-existence of God can no longer be taken into consideration; for it is disproved by the laws of nature themselves.

CHAPTER XII.

Evolution and Reproduction.

Protein, which has never yet been obtained except as a product of living bodies, is a complex compound of carbon, hydrogen, oxygen and nitrogen. United with a large proportion of water, it forms the chief constituent of a substance, which, in its primary unmodified state, is known as *protoplasm,* and which science regards as the physical basis of life. The bodies of all animals and plants are largely composed of it. There can be no reasonable doubt that life on earth first made its appearance in a speck or cell of protoplasm.

Living protoplasm is distinguished from non-living things by its peculiar methods of growth and reproduction. It *grows,* not by superficial accretion, as crystals grow, but by absorbing into its own body the substances which it uses as food, and then decomposing them and chemically uniting some of their elements with its own. Thus, the method of its growth is far more analogous to the process of digestion and assimilation than to the process of crystallization. It *reproduces its species* by detaching a portion of itself and leaving the detached portion to grow and develop in the manner above described. All living matter proceeds from pre-existing living matter. "The new form takes on the characters of that from which it arose; exhibits the same power of propagating itself by means of an offshoot; and, sooner or later, like its predecessor, ceases to live, and is resolved into more highly oxidated compounds of its elements" (Huxley).

No forms of matter which are either not living, or have not been derived from living matter, exhibit these characteristics.

As will readily be seen, the method of reproduction above described, necessarily results in multiplying the species by geometrical progression. In free cell life, where the successive subdivisions follow one another at short intervals, the multiplication is enormous, a single cell producing in a few hours, millions of descendants.

The various kinds of cells differ greatly from each other in size and form, some having a diameter of at least one one-hundred-and-twenty-fifth of an inch, and some being so minute as to be invisible under the highest powers of the miscroscope. Several species of these free cells are parasitic, taking up their abode in the bodies of the larger animals, where some of them produce disease and death, and for that reason have become familiarly known to us as "disease germs" or "disease microbes."

One species of free cells, the *amoebae,* has been made the subject of much scientific study and observation because it has been considered possible that some member of its family may have been the original ancestor of the human race. An amoeba is a comparatively large cell, approximating the one-hundred-and-twenty-fifth of an inch in diameter—a mere speck of soft and slimy protoplasm, but manifesting unmistakable signs of life by feeble pulsations and by pushing out temporary projections from its little body and presently withdrawing them and pushing out others at a different point or points.

It is able slightly to flex these projections, and thus to use them as a means of propelling itself about in the water and seeking its own food instead of waiting for the surrounding water to bring it. It devours a food particle by enveloping and absorbing it; and if by mistake it happens to lay hold of a mineral particle, unfit for food, it soon releases its prey and resumes its search.

In the amoeba, or some similar form of cell life, in process of time a change took place—some of the cells began to aggregate, in small numbers, into a line or other form, and to act together as a unit, surrendering their individual freedom for the sake of association and mutual assistance. This was a long step forward, resulting in an organized *animal* instead of a mere multiplicity of independent cells. The first form in which we recognize this association is the

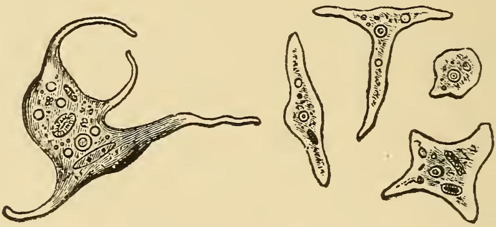

Fig. 13. Amœba.

gastrula, a tubular arrangement of cells, capable as a whole, of feeble locomotion in its native liquid, and suggesting by its form and function a diminutive *stomach,* in which the food is received into its interior and digested by absorption. The animal is so simple and primitive in its structure that if it be turned inside out it goes on with the process of receiving and digesting its food just as usual, the inverted stomach apparently answering every purpose.

It is conceivable that, through the operation of Darwin's first law of evolution, a slight variation of form or structure may have occurred in one of these little gastrulae. If that were the fact in any case, the variation would tend to reappear in the descendants of the modified gastrula, in accordance with the natural law of heredity that like tends to produce like. If not adapted to its environment so well as the original unmodified gastrula, or if the environment became changed so as to be no longer favorable to it, the modified form and its descendants would tend to disappear; and if in the further lapse of time another slight modification should occur and prove to be better adapted to its surroundings, it would tend to survive and become the parent of a progeny one step higher in the scale of existence than were its ancestors. So long as such slight modifications, followed by the survival of the improved forms, continued occasionally to appear, the evolution of physical being would continue to be gradually upward.

But the tendency to variation, being applicable to the modified as well as to the original forms, would inevitably result in branch lines, more or less fitted to their environments. In some of these, the course would continue upward; in others, it might be retarded, or perhaps arrested at a particular stage of development, beyond which the modified structure would never be able to pass, although still able to persist; while many of the branch lines would ultimately succumb to the difficulties of their situation and perish from the earth. Such is a brief outline of the early stages of animal evolution. So far as above set forth, the ascertained facts are in full accordance with Mr. Darwin's theory of evolution.

Many were the changes of form that might conceivably be effected in the primitive beings by successive and minute cumulative variations, and in strict accordance with Darwin's theory. But somewhere along in the upward course of development from cell to gastrula and thence onward to other forms, important changes took place, affecting both nutrition and reproduction, and difficult to account for on Darwin's theory of minute variations. For, the variations here were so radical in their character that it is hard to understand how they could have been brought about by slight cumulative modifications of the preëxisting structure. The cells gave up their individual function of digesting and assimilating food, and, for the future, that function was devolved upon a special organ created for the purpose and connected with means for conveying the nutritive elements of the digested food to all parts of the body. The cells likewise gave up, for all future time, their individual function of subdividing themselves for purposes of reproduction, and the reproductive function was lodged in a new organ, which, acting as the agent of the entire organization, produces a new cell and detaches it for reproductive purposes. How the new reproductive cell was formed, and how it was able to transmit the parental characteristics to succeeding generations, is a mystery that probably never will be solved. Mr. Darwin suggested as a possible explanation his hypothesis of *Pangenesis,* in which he assumed that the reproductive cell is made up of minute units derived from and representing each cell in the parental body. But the subject is further complicated by the fact that, both in animals and plants, there is a distinct differentiation of sex; which is an element to be reckoned with on any theory of reproduction, and which requires that the hypothetical units of Mr. Darwin's pangenesis shall be derived from the bodies of both parents.

Thus when, in considering the development of animal life, we reach the point where the cells gave up their individual functions of nutrition and reproduction, and those functions were taken in hand by special and complex organs, we are obliged to acknowledge that we have reached a point where Darwin's theory of development by successive minute variations of the original structure ceases to explain the facts, and where science surrenders its functions to speculation and guesswork. It is evident that a cause is at work which is deeper and more far reaching than any theory of natural evolution is able to explain, and that nature makes jumps from one form or structure to another.

It is remarkable that those jumps are always associated with evidences of intelligent design, and that nature, when she jumps from one form or structure to another, seems always to have a purpose in view. At one time, as when, for example, she jumps from the method of individual cell-reproduction to the method of forming the reproductive cell by a special organ representing the entire community of associated cells, her purpose is, apparently, to shorten the passage from the lower to the higher stages of development. At another time, as when she suddenly develops a new lateral bud on the tree of life, her purpose seems to be to provide for the subsequent creation of a new class of animals or plants. When she establishes an elaborate and complicated spinning-apparatus in the body of a spider, or arms the snake and the bee with an ingenious and an effective weapon for attack and defense, her purpose is self-evident.

Resuming consideration of the slowly-advancing animal race, at the point where it had unaccountably come into possession of internal reproductive organs for forming and extruding its reproductive cells, we will, for want of time, pass over the many millions of years during which it was groping through the fish-form of existence, then through the amphibious forms, then through the reptile form, and then, by a branch line, to the birds. Many things had happened in this long interval;[1] many organs had appeared in the animal body, of the origin of which Darwin's Theory of Evolution can give no explanation; many races composed of descendants from various side-branches had perished from the earth; the earth itself had visibly grown old, and had become a very different world from that in which life first appeared.

Birds were at once distinguished by three marked char-

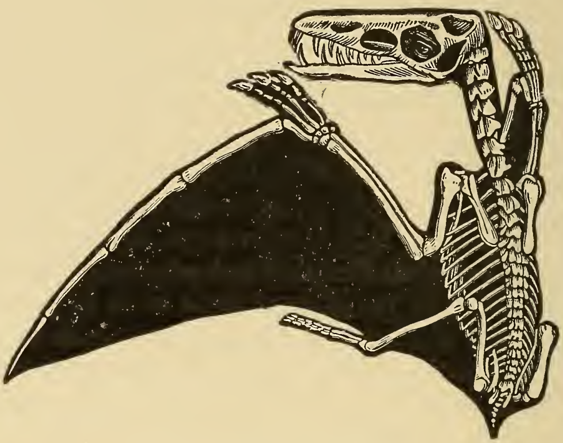

Fig. 14. Fossil pterodactyl.

acteristics: feathered wings, adapted to long flights; thin, hollow, marrowless bones, conducing to lightness on the wing; and reproduction by hard-shelled eggs. The wings had already been foreshadowed in the membraneous wings of a flying reptile (the pterodactyl) whose bones were also hol-

[1] The interval included the Laurentian, Cambrian, Silurian, Devonian, Carboniferous, Permian, Triassic, and Jurassic periods—much more than one-half of the time during which life has existed on the earth.

low; and feathers had made their appearance on another half-breed lizard-bird, the archæopteryx. All these and other intermediate types between the reptilian and the bird tribes proved to be unfitted for a successful struggle for existence, disappeared, and are known only from a few fossil remains accidentally preserved in the rocks. We have no knowledge how long they played their abortive part in Earth's life-history—perhaps millions of years, perhaps only thousands—but it was long enough, at all events, to effect, through the slow methods of evolution, the gradual transformation from lizard to bird. What "jumps" nature may have made, to hasten the result, we do not know.

At some period during the transforming process, the reproductive eggs began to be enclosed in hard mineral cases or shells;—a mode of preserving them that had never been adopted before, but which has ever since generically distinguished all birds not only from their relatives, the reptiles, but from all vertebrate animals. It is difficult to conceive of this sudden and radical change as having been brought about in any other way than by one of nature's "jumps" and for intelligent and wise reasons. All animals whose line of ascent ran through the fishes, the amphibians, and the reptiles, had, for millions and millions of years, invariably, deposited in the water eggs without such a shell. Now, a new genus of animals appeared, and suddenly nature decreed for it and all its descendants an additional law of reproduction!

The bird was to be a land-animal. Its reproductive cell was to be deposited on dry land. The cell was to mature into a chick by a process of development which would require a considerable period of embryonic life. How could that life be supported on dry land, and exposed to the atmosphere, during so long a period? Apparently there was but one way of doing it, namely, by storing up with the cell a plentiful supply of food for use during its embyronic life, and enclosing both together in a case or shell sufficiently strong and hard to protect them from injury until the shell should be no longer needed. This provided perfectly for storing the cell and its food together, and for protecting them from the attacks of insects; and, for a considerable time, it was capable of keeping them safe from atmospheric germs. But something more was necessary: first, the life of the cell was not active but dormant, and, while in that condition, it could make no use of the food-supply; and, therefore, secondly, some provision must be made for starting the life of the cell into activity. At that juncture nature, by some means known only to herself, managed to inform the mother bird that what the egg needed to start it into active life was the vital temperature of its race. She took the hint, sat upon the eggs day after day to warm them into life, and at last was rewarded by seeing them burst open their temporary prison, permitting the occupant to come out and take up the routine duties of bird life.

I am unable to see how Mr. Darwin's Theory of Evolution can explain these facts. The first limestone egg-shell cannot be accounted for on the hypothesis that it was formed by slight variations of a preceding structure, unless a mineral shell of some kind be shown to have existed before it. If we assume that a thin membrane had previously covered the yolk, as in fish-eggs and frog-eggs, we find that membrane still present in birds' eggs; so it is evident that it had not been converted into a shell. That which requires explanation is the hard mineral shell built up over the membrane—how did *that* originate? It was an entirely new departure in egg morphology—nature seems to have taken a flying leap at this point. If it be suggested that probably the membrane began to act as a gland, depositing upon its exterior surface a coating of limestone; the sufficient answer is, that this is guess-work and not science.

Besides, all fish eggs and reptile eggs must always have been covered with a thin membraneous skin sufficiently tough to hold their contents together and prevent them from dissolving in water. They are, to this day, invariably and necessarily provided with such an integument; but it has no glandular action. To enable it to build up around the egg a thick, hard armor-plating of limestone, the membrane would have to be constructed with internal mechanism able to extract molecules of calcium carbonate from the materials surrounding it and arrange them in regular order around its own exterior surface. In other words, the action would be a true glandular action, and could no more take place without gland-mechanism, or cell-mechanism equivalent to it, than bone could be formed without the action of a periosteum or saliva secreted without the action of a salivary gland. Things do not make themselves.

But the bird's egg does not produce its shell. On the contrary, it is produced by the reproductive organs within the parent bird's body; and nature clearly took a flying leap in adding to those organs mechanism, before unknown, for investing the egg with a hard protective armor.

And how did the mother-bird, when she discovered that her egg was shut up within calcareous prison-walls, get the notion that by sitting on it continually for a long time its prison-walls would open and release a chick? In the original incubating bird, that concept or expectation could not have been suggested by any previous experience or observation. And, stranger still, where did the bird get the knowledge, that, during the tedious process of incubation, the egg must be carefully turned over from time to time or trouble and disappointment would result? In hatching eggs in an incubator, man has learned this secret by experience; but the birds have always known it. With their bill they turn over all the eggs in their nest every few hours, and are rewarded with a brood of perfect chicks. Man, with his incubator, has learned that in hatching hens' eggs, for example, unless he turns the eggs once a day during the first ten days of incubation, and oftener during the remaining period, the chicks will come out maimed or deformed, or will perhaps never come out at all; the reason being that as they increase in weight they settle down through the soft substance of the egg, become attached to the lower part of the shell, and their further normal development is interfered with or perhaps completely prevented. The inexplicable thing in all this is, that the bird knows that the egg must be turned, and never fails to attend to it! By what inspiration did she learn to do this? The practice must have begun with the first egg, or there never would have been any more birds; hence it could not have arisen by the processes of evolution. Will anybody suggest that she does it through *"instinct"?* Certainly, no ultra-evolutionist will make such a suggestion; for we are told in their books that instinct itself is the result of evolution, and therefore this attempt at explanation would only increase the difficulty. No explanation, that I can conceive of, suffices to account for the bird's "instinct" for warming her eggs into life by sitting on them, or for turning them over from time to time during the process of incubation. To my mind, the subject is as inexplicable as the origin of life itself. The bird does not do these things by chance, nor through any scientific knowledge of the facts, nor can we point to evolution as holding the key to the mystery.

Returning to the ascending family-line of man, from which we have briefly digressed to consider the reproductive methods of birds, we come, in the eocene period, to a genus (the marsupials, or pouched animals), which is distinguished by a striking peculiarity in its method of caring for its young. Animals of this genus (including the oppossum, the kangaroo, etc.) are provided by nature with a pouch or bag, in which to carry their new-born young until they become able to take care of themselves. The maternal nipples (then existing for the first time in animals) project into the cavity of the bag and can be sucked by the little ones while they are carried about in the parental haversack. The bag is supported by a couple of bones specially provided for the purpose. The young are born in a very imperfect condition, after only a month of gestation, and they remain in the bag until fully matured, which in the larger kangaroos involves a period of nine months after birth. By what initiative the two supporting bones began to be formed, or the external sack to be prepared to receive the future progeny, no information is given by the laws of evolution. But all three first made their appearance together, so far as we have any knowledge; and they furnish as clear a case of *obvious* contrivance as it is possible to conceive.

It will be interesting briefly to compare the two widely different developmental methods tested in the birds, on one hand, and in the marsupials, on the other hand. One might almost fancy that nature was here trying two experiments, to ascertain which method was best for her purposes. By the one method, the period of gestation was spent in assembling a supply of food for the life-germ, and boxing up the germ and the food securely together; at the end of which process the box, with its contents, was expelled from the body. The work of developing the future animal then began, by applying to the box the heat of the parent body. At the close of this work the chick was sufficiently mature to pick its way out of the box; and then, after a week or two of feeding and protection, it was ready for its life work. The experiment was apparently satisfactory, and the reproductive method was permanently adopted for the bird tribe. It has resulted in accordance with Darwin's laws of modification by successive slight variations and the survival of the fittest, in peopling the earth with an innumerable family of beautiful creatures, without whose presence this world would be deprived of one of its greatest charms. The other method, that of employing a brief period of gestation in partially developing the life-germ into an immature animal form, then expelling it into a sack or pouch carried by the parent and supplied with the necessary food until the embryo is fully matured, apparently was not found satisfactory in result, although thoroughly tested. Marsupials spread, for a while, over every continent on the globe; but they have long since died out, leaving extant only a few representatives of their race. Darwin's Theory of Evolution undoubtedly accounts for their gradual extinction, as it does for the survival of the bird tribe. But it does not account for the *origin* of either the bird race or the marsupial race. It does not account for the first appearance in nature of the limestone egg-shell, the marsupial pouch, or the specially-created bones for the support of that pouch. These things manifest in nature evidence of design and purpose; and require for their explanation the assumption of some principle deeper and more far-reaching than the laws of evolution.

I have spoken of the birds as originating on a side-branch, and not on the main stem by which the animal race was slowly ascending toward its ultimate culmination in man. Many a side-branch appeared from time to time through the long course of ages, arising from lateral buds formed on the parent stem but whose origin there cannot be explained on

Darwin's Theory. Many of the side-races thus begun were doomed to ultimate extinction through the inexorable laws formulated by Mr. Darwin, and their fossil skeletons are all that remain to reveal to us their former existence. But many of them have survived, and through the operation of the same inexorable laws have peopled the earth with the almost innumerable varieties of animal forms now existing. Many of these forms, too, have undoubtedly reached the highest degree of perfection attainable within the limits of their constructive plan. Some of them are useful or beautiful members of the animal kingdom, but they are not, and their descendants never will be, at its head. That distinction, nature has reserved exclusively for the being who, through all the chances and contingencies of the perilous ascent, has stuck persistently to the main stem, and has finally reached its topmost pinnacle.

In her long course toward the final consummation of her plan, nature, as we have seen, treated the marsupial pouch as only a temporary expedient, to be cast aside when the time should come for adopting a more permanent method of construction. When the time came, she simply dropped the pouch and its supporting framework, and lengthened the period of gestation. The animal was now born more fully matured; but it was, as yet, an unfinished organization, capable of performing only the mere physical functions of a low order of quadruped life. The whole period of the long Tertiary Age, probably several millions of years, was spent in slowly modifying and perfecting its structure, and, especially in producing a form of skull and a construction of mental equipment which should be adapted to a higher plane of existence. Finally, in the fullness of time, and as the perfected successor of the marsupials and all their progeny, man came, with his high physical and mental organization qualifying him to take his predestined position at the head of nature's animate works. It is worthy of remark that the slow growth of his individual development, requiring a period of from twenty to twenty-five years in the passage from infancy to adult life, has been one of nature's most beneficent provisions, affording his offspring ample and needful time to fit themselves for the duties of life while still under the protecting care and guidance of the more experienced parental intelligence. Indeed, without this wise provision, man would have been seriously handicapped from the beginning, and in all probability would have remained, till long after the present time, only a superior order of wild and savage brute.

Before leaving the subject of man's evolution, rising step by step through the long succession of his lower ancestors, I desire to call attention to a most remarkable and significant fact indicating the fertility of nature's inventive resources and the skill with which she is able to devise and make use of temporary expedients while carrying forward her plans for a more stable and permanent structure: just as a mason who plans an arch of brick or stone that will stand for ages when its keystone is in place, finds himself obliged to support the arch by a temporary scaffolding during the final stages of construction, until the keystone has been inserted and the scaffolding removed. Nature's engineering problem arose in the following way: she planned a permanent animal-structure in which, when finished it was necessary that lungs should exist to aerate the blood and furnish the required heat; in the process of the development of that structure in the mother's womb, the lungs could not act for want of air, but the heart had to act to maintain the circulation which carried to all parts of the embryonic body the materials that were necessary for building it up; the lungs had to be thus built up, as well as the rest of the body, and to be ready for use for breathing purposes at the instant of birth; now, how could matters be so arranged that the embryonic blood should be constantly and thoroughly aerated and purified without going through the lungs for that purpose; that, however, a limited, but sufficient, quantity of blood should go to all parts of the lungs to keep up their supply of building material; and that, at birth a complete air-purification by the infant's lungs should be substituted for the provisional arrangement;—this was the problem to be solved, and its solution required no small degree of inventive ingenuity. Nature was equal to the emergency. For the constant aeration and purification of the fœtal blood, she established in the mother's womb during pregnancy a temporary organ called the placenta, by means of which the fœtal blood is interchanged with the maternal circulation already purified; she formed a provisional opening between the chambers of the fœtal heart, through which the heart of the unborn child keeps up a free and full circulation while sending to the lungs only the quantity of blood necessary for their development; at birth, she severs the connection to the placenta, discharges the latter from the parent's body, fills the infant lungs with air, and rapidly closes up the temporary opening between the chambers of its heart. The work is now complete. And who can understand its history without a feeling that the Creative hand is almost visibly displayed in it? The revelation of design could not be more conclusive to any thinking mind.

And through all the stages of man's life-development —from the cell to the gastrula; from the gastrula to the vertebrate; through the vertebrate to the quadruped, and through the quadruped to man—there runs a wonderful unity of coherent design; a plan which cannot be mistaken for the occurrence of mere accidental coincidences, but in which there are indubitable evidences of constant prevision and of preparation for the steps that were to follow, and did follow, in their appointed order.

By these evidences, of which, as we have seen, innumerable examples are found in every department of organic life, the thinking man is forced to the conviction that the entire scheme of evolution, so far as its working can be seen, is under the supervision of an infinite mind, which is able both to plan and to execute. There is no other conceivable way of accounting for the known facts.

How the steps which have been called "nature's jumps" have been brought about, we have no means of knowing. Huxley, Nicholson, and other leading evolutionists, have been led by them to suspect the existence of some deeper and more far-reaching law of evolution than any discovered by Darwin. Perhaps they are correct in this; but it must be borne in mind that the existence of one law affords no reason for predicating the existence of another. The natural tendency to assume that because things are seen to be regulated by law in some respects they must be in all, is based only on our own limited experience and observation, and has no application to the Infinite mind which is a law unto itself. All that we can say about the undiscovered laws of evolution is that we know nothing about them, nor even that any exist. Nature has left the origin of life an inscrutable mystery and she seems also to have left the deepest secrets of its embodiment in physical forms an equally impenetrable mystery. Enough for us to know that she reveals everywhere the operation of an infinite creative intelligence. Nothing appears to have happened by chance; everything by design. Perhaps we may be told that many useless things *may* have happened by chance and afterwards disappeared because they *were* useless; but that suggestion is mere conjecture, in the absence of actual evidence; whereas, obvious contrivance needs no evidence to prove that it had a contriver.

CHAPTER XIII.

Evolution and Design. The Range of Evolution Limited.

Darwin's theory, as we have seen, endeavors to account, on the ground of natural causation, for the evolution of all past and present forms of animal and plant life, and to explain the causes that have contributed to the deterioration, or even the extinction of some of those forms. In attempting to explain the *origin* of forms and organs upon the assumption that they have resulted from the gradual modification of preëxisting forms or organs, it sometimes subjects our credulity to a severe strain; as, for example, when it tells us that a turtle's legs and a bird's wings and legs have all been developed from a fish's fins, and even that our own legs and arms have been derived from the same source. Possibly, these assumptions may all be true, but there is no real proof of it. A hundred thousand years hence, some future scientist may stumble upon the buried remains of one of Orville Wright's flying-machines, and conclude that it, also, bears evidence of a fish ancestry. Undoubtedly, he would be able to make out quite a plausible case for his theory.

When Darwin's Theory undertakes to account for *origins,* upon the hypothesis of the gradual modification of preëxisting forms, it is beset with insuperable difficulties. For example, when the Marsupials grew a pair of strong bones extending under the skin from the hips forward along the abdomen, to serve as curtain-rods by means of which to suspend the apron as a sort of bag or pouch in which to carry the young, how came these two bones to appear there? No bones were there before in four-legged animals, nor ever have been in other animals than marsupials. Or if there ever were such bones in any now-extinct animals that may have existed in the long period between the Age of Reptiles and the Age of Marsupials, they have been wholly obliterated in their descendants; thus showing that the forces of evolution tend to *destroy* such bones, not to *create* them. And how came the skin to grow double at that place, so as to provide a pouch which could be thus suspended, and which would leave the nipples extending into but not through it? And how came its forward edge to be *unattached,* so as to form a mouth to the bag? Evolution can give no answer to these questions. Its laws, as explained in Darwin's Theory, are utterly antagonistic to the supposition that it can furnish any answer to them. It might possibly account for the pelican's pouch by assuming that a habit of temporarily storing fish in the rear portion of its mouth had gradually swollen out its neck so as to form of it a sort of pouch convenient for the purpose; but this explanation is not applicable to the marsupial pouch. In fact, nature, by shortening the period of gestation, created the necessity for the marsupial pouch, and at the same time provided the bag in view of the shortened gestation. If the kangaroo had delivered its young when they were only an inch or two long, as it now does, the race could not have survived in the absence of the pouch —indeed would have perished at once; so that we are justified in assuming that the pouch appeared *first,* or, in other words, was created in anticipation of the change of gestation, which was contemplated by the author of nature, but had not yet been put into effect.

Of course, the animal had nothing to do with the shortening of its period of gestation; had no control over it whatever. Nor had it anything to do with the creation of its strange pouch, or the supporting framework of it. There is no causative relation between the two things, time of gestation and pouch, by which either would have caused the other, nor any relation between gestation and the two extraordinary bones—and no conceivable explanation of the facts except that the Author of nature had planned the change, and had proceeded intelligently to prepare the way for it.

Again: When Darwin's Theory encounters the osteoblasts and osteoclasts in their work of superseding soft cartilage with hard bone, it meets an obstacle which it can neither move, nor get over, nor get around. And, more than that, it meets with conclusive proof that nature's processes are not continuous, but are sometimes suddenly exchanged for processes of an entirely different character. The exchanging of one process for another and different one is not *evolution*, but is an act that unmistakably indicates intelligent judgment and choice.

The horse is an animal, the beginning of whose existence as a quadruped dates back to the early years of the Eocene period or even possibly to the antecedent Cretaceous period. Scientific research has collected from the rocks of the Tertiary and Quaternary Ages a consecutive series of fossil skeletons of the horse, showing its ascending stages of development, from a soft-footed animal, about as large as a medium-sized dog, to the magnificent race-horse of the present day.[1] Nothing could be more impressive to the ordinary mind than this exhibit. Taken in connection with the *Hipparion*, from the Miocene deposits of India, and the *Anchitherium*, from the older Miocene beds of Europe, a series

[1] This series of horse skeletons was collected by Professor O. C. Marsh from the Tertiary strata of the Rocky Mountain region, and is at Yale University.

of fossils from the American rocks gives us an outline of the horse's genealogy so fully and clearly as to leave no room for reasonable doubt on the subject. This series, considered in its chronological order of development, includes the *Eohippus* from the oldest Eocene, the *Orohippus,* from the later Eocene, the *Mesohippus,* from the early Miocene, the *Miohippus,* from the later Miocene (coeval with the European Anchitherium), the *Protohippus,* from the later Miocene (coeval with the East Indian Hipparion), and the *Pliohippus,* from the Pliocene. The fore foot of the Eohippus shows the second, third, fourth and fifth toes, and a rudiment of the first; and the hind foot shows the second, third and fourth toes, with a trace of the fifth. In the Orohippus, the fore foot shows the fifth toe retracted upwards, but still probably able to reach the ground; and the hind foot appears with three well-developed toes only. In the Mesohippus, the fifth toe is even still more rudimentary. The Protohippus has only three well-developed toes. In the Pliohippus, the second and fourth toes of the earlier Protohippus have withdrawn upward, now appearing as splint-bones, and the third toe, terminating in a hoof, closely approximated to the fully developed structure of the horse, differing only in the fact that in the horse the two splint-bones have retracted slightly farther upward. The succession of these anatomical modifications is shown in the following cut:

It will be observed that the earliest representative in this development series is missing. There can be no reasonable doubt that it existed, back in the preceding chalk-age, at the close of the cretaceous period, as a small soft-footed animal with five fully-developed toes on each foot. From that time onward, it slowly lost four of these toes, commencing with the first and fifth, which have entirely disappeared, and continuing for a while with the second and fourth, which have withdrawn upward and now appear as mere rudiments in the horse, leaving the original third toe to perform, unaided, all the functions of a foot.

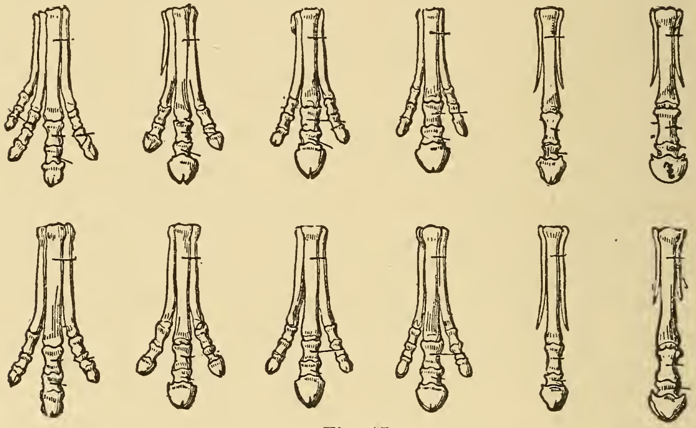

Fig. 15.

A review of the horse's paleontological history makes it clear that Darwin's Theory of Evolution is, in part, founded on fact, and that, in certain cases at least, the evolution of one form from another does take place through slow successive slight changes of structure. But it discloses nothing that in the slightest degree affects the force of the argument from contrivance or design. All the modifications that occurred in the evolution of the equine foot and leg, from the time of the ancient Eohippus to that of the modern racehorses, were losses of *old* structures, not creations of *new*—and were only changes of mere form and size. The little animal was developing into a big one, swift of foot and dwelling upon the hard ground; and under such circumstances, its increase in size and weight might be expected to effect a gradual change in the form and structure of its feet and legs. In such cases as this, Darwin's Theory accords both with reason and with observed facts, and indicates only evolution.

Many other illustrations may be cited from the animal kingdom, tending to render perfectly clear the distinction between those structures which can, and others which cannot, be accounted for by the Theory of Evolution. For example, the ocean teems with an inconceivable number of minute animaculæ that emit phosphorescent light. It is easily conceivable that such light may be due to phosphorus imbibed from the surrounding sea water. On the other hand, the intermittent light flashed at will from the brilliant and beautiful fire-fly can be accounted for on no theory of evolution. It is apparently of an electric character, although destitute of heat, and is produced by mechanism under control of the insect's brain. Man would give a great deal to know the secret of producing such light, but he has never been able to discover it.

The *gymnotus,* a species of fish or eel, inhabiting some of the inland waters of South America, is provided with an electric battery capable of administering a severe electric shock to those animals which incautiously come in contact with it. How can the origin of such an apparatus be accounted for on Darwin's Theory?

On the other hand, the many varieties in size, form, color, agility, strength, and other characteristics, which we observe in animals of the same species, are generally, although not always,[1] referable to evolution. In most cases they are undoubtedly due to differences of environment through which the ancestral race has passed. And it is to be observed that man has evidently had much to do with the evolution

[1] See remarks upon the Ancon sheep, *post.*, p. 229.

of these varieties; for they are particularly remarkable only in the races of animals that have been for ages subject to domestication and to direct individual contact with man, and especially in those that are adapted to furnish him with household pets or constant companions. Wild animals, and those of large size, present few of such varieties; but the dog, that faithful friend and affectionate companion of his master; the cat, the household pet of her mistress; and even the hen and the dove, who practically make their home at the family residence, have, by careful selection and cross-breeding, developed multifarious formal modifications of the common stock. This is the distinctive province of evolution.

But the moment that we meet with unanswerable proofs of creative contrivance, such as those to which our attention has already been repeatedly called, Evolution sinks to a position of only secondary consequence, becoming a field for the gratification of scientific curiosity rather than for the discovery of important and far-reaching truths. For, if there exists in nature even a single instance of creative contrivance, then there exists an intelligent Power which dominates nature and all of its so-called "laws," and uses the processes of Evolution simply as one means, and not in any sense a necessary means, of carrying out its plans. Creative contrivance—and not evolution, is, therefore, the key to the question of supreme importance to the human race. And the evidence of its existence and action is found in every department of nature's animate works, and is conclusive.

The range of Darwin's Theory of Evolution is, therefore, limited. It does not pretend to account for the origin of life, except by admitting that it was due directly to a creative act. It cannot bridge the vacant paleontological spaces that exist in the assumed line of succession from monad to man, except by mere conjectures. It does not satisfactorily account for the origin of new organs or structures. It is unable to answer the innumerable proofs of creative contrivance, and the clear evidences of creative design. It is flatly contradicted by the osteoblasts and the osteoclasts.

It does, however, in most cases, fully and satisfactorily explain the modification of external organs, and the loss of organs or structures by disuse. In this, it has contributed materially to the advancement of human knowledge.

CHAPTER XIV.

Contrivance Shown in Nature's Inanimate Works.

"The Heavens declare the glory of God, and the firmament showeth His handiwork."

Let us now turn our attention to nature's *inanimate* works, to see whether we can discover, in these also, any proofs of Creative design. We could not reasonably expect *a priori* to find in mere matter, or mere force, conclusive proofs of design; for science knows nothing of the origin or nature of ultimate matter or of force.

But if there be found in the material universe conclusive evidence of contrivance, then that universe itself will, independently of all other sources of evidence, prove the existence of a Creator, and probably shed more or less light upon the purpose for which the established order of things that we see around us was brought into being. And if, on the other hand, there should be found evidence that is strongly persuasive (though not conclusive) of contrivance, it would be in harmony with, and corroboration of, the conclusive proofs already discovered in the *animate* works of nature—corroboration, both by adding its own strength to that of the proofs already considered, and also by meeting, in advance, the argument that the absence of all proof of contrivance in the material universe would tend to discredit the conclusions drawn from other evidence, there being apparently no reason why contrivance, if really found in the animate works of nature, should not also appear in her inanimate works.

It would be unprofitable to enter upon a dicussion of the speculative conjectures by which men have endeavored to account for the universe without recognizing the existence of an intelligent Creator—unprofitable, because they are mere speculations and guesses, unsupported by the slightest evidence and therefore unworthy of consideration. One favorite assumption of these visionaries is, that the universe is continually undergoing a process of reconstruction and renewal through the occasional demolition of a planet or a sun in consequence of the collision with it of a comet or other celestial body; and that, therefore, the cosmos cannot be conceived of as having had a beginning, or as being under the care of a controlling intelligence. But, it has been calculated that such a collision with a comet could not occur oftener than once in fifteen million years; and, from what we now know of comets, we have every reason to believe that such an impact would be substantially harmless to everything but the comet itself. Less than fifty years ago, the earth actually passed through the tail of one of these comets without the slightest disturbance. Whether burned-out suns ever collide with planets or other suns we do not know. The sudden appearance of a bright light for a few months on the far-off boundary of the universe has been thought to indicate such a collision; but there is no certainty of it, and no proof that any such collision ever happened. All is mere speculation and guesswork. It may be true, for aught we know, that the Creator does take that method of renewing His wornout suns, but, if so, it does not justify the inference that there is no God, but, rather, the contrary.

The baseless character of many of these so-called "scientific" speculations is well illustrated by a conjecture put forth a few years ago to the effect that atoms and molecules cannot exist in the sun because, as was assumed, its intense heat would destroy their organization and reduce their components to the ultimate form of cosmic matter. Of course, nobody knows what was the ultimate form of cosmic matter, and nobody has visited the sun, or ever will visit it, to ascertain the local effects of its heat. What an excellent opportunity was thus presented for theorizing about something that can never be proved or disproved, and for amazing

> "the gazing rustics ranged around,
> With words of learned length and thundering sound!"

The great majority of these baseless speculations are set forth in the name of Evolution—meaning, by Evolution, not Darwin's theory of animal and plant development by variation and "natural selection," but the speculative and unprovable hypothesis that all things, animate and inanimate, including even life and mind, have gradually evolved from preëxisting forms of matter, through the supposed operation of some general, but utterly inscrutable, law of the universe. This is the fundamental doctrine of materialism.

But the great difficulty that stands in the way of all these speculative hypotheses is, that the universe is, evidently, a vast *machine;* and that machines cannot be constructed without contrivance, nor can contrivance take place without the exercise of mind. It requires no extraordinary mechanical intuition to discover that our solar system, for example, is a mighty machine, and that it is mechanically connected with all parts of the universe within the range of our telescopes and spectroscopes. It is impossible that the regularity and order of its movements, the harmony of its coöperating parts, and the tremendous forces employed in impelling and directing them should fail to impress any intelligent mind with the idea of mechanism. That it is a machine in no mere metaphorical sense, but in the practical signification of the word, has been visually shown in Graham's machine, the Orrery, built to represent in miniature the movements and relative magnitudes and distances of the planets revolving with their satellites around our sun. His illustrative model, of course, represents those facts in a very imperfect and inadequate way; but it is enough; for, if anyone doubts that the solar system is a great machine, a glance at the mechanical model will speedily convince him of his error. *If it takes a machine to represent it, the thing represented must be a machine.*

Newton's great discovery and demonstration that gravitation is the main spring and momentum the regulator, which cause and control the movement of suns, planets and comets, was a complete confirmation of the mechanical theory of the universe. Since that discovery, we know positively that the universe is a machine; and therefore thinking minds have little confidence in those conjectures that would exclude from it the idea of an intelligent Creator. Machines do not *grow,* but are *made.*

Newton's achievement was something more than a discovery; it was a *revelation,* making known to us the form and condition in which matter was created. If all matter in our solar system, exclusive of the sun, were collected into one mass, the laws of motion discovered by Newton show that that mass would fall in a straight line directly into the sun, as the apple fell upon Newton's head. But, being divided into separate masses, at different distances from the sun, the same laws show that none of those masses can, or ever could, fall into the sun—the reason being that their attraction for each other causes them to diverge from straight lines extending towards the grand center of attraction, and their momentum then coacts with gravitation to compel them to pass in elliptical orbits around that center. These facts not only indicate creative design, but they also indicate that, in the beginning, chaotic matter "without form and void" occupied an inconceivably vast portion of the infinite nothingness which we term "Space," and that gravitation and momentum, opportunely taking advantage of an unequal distribution of such matter, proceeded to organize it into suns, planets and comets. Indeed, the work of organization seems to be not yet completed; for the telescope reveals to our eyes many vast tracts of nebulous matter at inconceivable distances from our solar system,[1] and in some of them are stars which apparently are suns still forming out of the surrounding matter.

The mighty machine which we have been considering not only displays clear proof of creative contrivance, but excites our wonder and admiration at the perfection of that contrivance. For it is a perpetual-motion machine, running without friction, and perfectly self-regulating. The ingenuity of man has never been able to invent a machine having any one of these three characteristics, yet here they are, all in one machine, and in every working member of it. And the amazing thing is, that the skeptical materialist assumes that all parts of this machine came together by chance and without the exercise of invention!

But let us look further into the construction of this great machine, to see if we can discover the secret of its driving-power, gravitation,—a secret which involves both the origin and the transmission of the tremendous force that handles

[1] Those enormous distances are measured in terms of "light-years," for convenience of expression. A light-year is the distance which light travels in one year—more than seven trillions of miles. The distance from the earth of 168 nebulæ (a very few, in comparison with the whole number known) has been found to average 700 light-years; or, in other words, about five thousand millions of millions of miles.

suns and planets as though they were grains of sand. We find the secret of the *origin* of gravitation to be utterly inscrutable, but its *transmission* evidently depends, in some unknown way, upon the luminiferous ether. For, we cannot conceive of mechanical power being transmitted without some

Fig. 16. Nebula.

adequate means of transmission. We know, from the operation of our dynamos, that the ether is an adequate means for the transmission of enormous mechanical power. So far as science is able to inform us, there is no other substance than ether which extends continuously from every star to every other star, and even from every atom to every other atom in the universe. There can, therefore, be no reasonable doubt that the luminiferous ether is the means employed for transmitting the motive-power of the celestial machinery.

The more we study that machinery, the more wonderful it appears, and the more conspicuous is the fact of its creative contrivance. So far as it is composed of *matter,* it obeys the laws of matter just as do all the machines invented by man, and we can as readily understand it as we do man's machines. But, as we have seen, it is not composed of matter alone, but contains, as one of its most important factors, the luminiferous ether, an element which has none of the characteristics of matter, and which, to distinguish it from matter, we have designated by the word "substance." The ether has no atoms, no molecules, no weight, and no resistance—all which are fundamental characteristics of matter. Every atom of matter is separated from every other atom by intervening ether; and even the infinitesimal elements which compose atoms seem to be separated from each other by ether. The ether alone is solid—infinitely solid—and yet in all of its parts infinitely mobile. The human mind can hardly realize these facts. Accustomed as we are to the characteristics of matter, it is well-nigh as difficult for us to conceive of the immaterial ether as it is to conceive of an immaterial soul; and yet it exists, and we make practical use of it in our dynamos and our wireless-telegraphy; as the Creator makes practical use of it in transmitting the force of gravitation.

In the Creative plan, it was necessary to fill the universe with some substance which should be capable of transmitting mechanical power, and yet incapable of resistance to any matter passing through it. We know of no such substance except the ether. But what a strange conclusion would it be, to assume that it was by mere blind *chance* that the universe was filled with the only substance which could have set the mighty machine in motion and kept it forever from running down! Do such mechanical coincidences happen by chance! Is it not more reasonable to believe that He who fashioned the valves of the heart; who contrived the wonderful mechanism of the eye; who fitted out His spiders with spinning-machinery that is little short of the miraculous in construction and operation; who devised special muscles that can work, night and day, for a hundred years without rest or sleep; who foresaw and confounded the evolutionary speculations of materialism by setting His osteoblasts and osteoclasts at work to manufacture bone in defiance of the supposed "laws" of Evolution; who has displayed in countless other ways the infinite resources of His creative mind; and who was the only intelligence that had anything to do with the construction and organization of the universe; than it is to believe that the luminiferous ether owes its strange qualities to chance, or took its place in the structure of the universe-machine in any other way than by Creative design?

Let us consider still more closely the question of contrivance as displayed in the construction and operation of that mighty machine which we term the Universe. For our facts, we shall rely upon no speculation or guesswork, but only upon the unanswerable demonstrations of the higher mathematics.

Of the building materials, matter and ether, it is unnecessary to say anything more than has already been said. Throughout the universe, they are the same as we know them here on Earth. Indeed, some forms of matter man did not find on Earth until after his spectroscopes had first detected them in the sun and he had thereby been led to search for and discover them on our planet also.

We are familiar with the forces, gravitation and momentum, having occasion to make use of them daily in the ordinary affairs of life, and therefore knowing their general nature and their laws. We are thus enabled not only to calculate, as Newton did, what must happen when these forces are acting together upon matter, but also to calculate what must have happened in the beginning had either of them been acting alone.

Gravitation and momentum are defined as follows: Gravitation: That which causes every atom in the universe to tend to move towards every other atom with a force directly proportional to the product of their mass, and inversely proportionate to the square of the distance between them. Momentum: That which causes matter, when set in motion in any direction, to move with a degree of energy directly proportionate to the product of its mass multiplied by the square of its velocity.

As we have seen, these forces, acting together upon matter, were the means by which nature, or, in other words, the author of nature, wrought out and still governs, the structure of the universe. They comprehend the mechanism—nay, they themselves *are* the effective mechanism which controls the movements of the stars and planets. When man constructs a machine, he provides it with motive power, belts, shafting, gear-wheels, pulleys, springs, adjusting screws, and other equipments, to insure its satisfactory operation; and it soon gets out of order, needing readjustment or repair, or even reconstruction. But the mighty engine of which these two forces are the controlling mechanism, never gets out of order, never runs down, furnishes its own motive-power, and renews itself forever! What inconceivable ingenuity was necessary to produce such amazing results with means so simple!

Gravitation, acting *alone* upon matter evenly distributed through space, would have caused it to fall directly, in converging lines, to the universal center of gravity, where it would have become massed together in the form of a globe of inconceivable magnitude and incalculable centripetal pressure.

Gravitation, acting *alone* upon matter unevenly distributed through space, would have caused the larger masses throughout space to draw to themselves the matter immediately surrounding them, and the augmented masses, in the form of globes, to fall to the universal center of gravity, with the same final result as before.

Thus, gravitation, uncontrolled, could have accomplished no other result than the dumping of all the materials into one vast globular mass, where they would have remained, glowing with fervent heat, for ages whose duration is beyond the power of the imagination to conceive. On the surface of that great central mass, no life could ever exist, for the enormous centripetal pressure would render all superficial bodies immovable. It is calculated that at the surface of our sun a man of average size would weigh a ton—judge what the conditions would be at the surface of a sphere inconceivably greater than the sun!

From all such disastrous conditions, the universe was saved by momentum, which, coacting with gravitation, deflected the falling masses from their course toward the center of gravity, and compelled them to travel forever in circular or elliptical orbits around that center. And see how simple its parts, and yet complex in its action and infinitely perfect in its operation, that combination was! To make our explanation clear, we will assume that, under the influence of gravitation alone, two separate masses of matter, say, at the distance of a billion miles from the center of gravity, and at a considerable distance from each other, were falling at different velocities (one, perhaps, having traveled farther than the other), straight towards the center of gravity. The two masses would attract each other, and thus tend to converge, and to unite before reaching the central sun. But now suppose that, when they began to converge, the force of momentum was added to their equipment. This force, when it gets into action in a body moving at great velocity, tends to move it in a straight line and with an energy not only exceeding that of gravitation but also increasing much more rapidly than that of gravitation. The result would be that the two masses, instead of coming together and falling into the central sun, would cross each other's path and shoot off into space, one in one direction and the other in another, and would recede from each other so far that we may now, in our further discussion, confine our attention to but one of them. This one (it matters not which of the two we take for illustration) is still under the increasing influence of the sun's attraction; but it is also under the far more rapidly increasing influence of its own momentum; so that for the time, momentum has become the master-force and attraction a regulating-force tending to draw the mass toward the sun, but resisted by the inertia of the mass which tends to keep its movement in a straight line in the direction in which it is going. Under the action of these forces, the mass does not fall into the central sun, but shoots past it with tremendous velocity. The instant that it is past the sun, presto, change! Gravitation, which up to this time has been an impelling force, now suddenly becomes a resisting-force, tending to check the wild speed of the flying mass, bring it around to the other side of the sun, and administer to it a parting kick to help it to return to the place whence it came. In other words, gravitation now opposes momentum until the mass has been obliged to turn back on its course, then unites with it until the moving body passes the sun on its return trip, then changes once more to an opposing force (but opposing with gradually-decreasing energy) and, slowly overcoming momentum, wheels the mass around to the place whence it came, where it sets it once more into motion towards the sun, with the same result as before.

How is it possible for anyone to turn his attention to the action of this wonderful mechanism without feeling, irresistibly, that it is the invention of an infinite creative Intelligence! Observe the perfection of its mechanical operation, the strange play of the shifting forces, which now reinforce, now oppose, each other, but always apparently keep the purpose of the invention in view, and tend constantly to further it, whether by mutual aid or mutual opposition; and consider the simplicity of the means which together work out the great result. Who but God himself could have planned such a structure!

But perhaps you are not yet convinced that the Creator contrived the ether as a means of operating without friction the great machine which He was preparing to construct; or even not convinced that He knows what frictional resistance is, and for what reasons it is generally desirable to suppress it, so far as possible, in operative mechanical structures. Let me assure you that He knows all about friction and has often had to deal with it in His other machines; and that He has never failed to deal with it successfully, although often obliged to contrive means for overcoming it. In the parietal and pulmonary pluræ, for example, where two large surfaces are required to rub against each other continually for perhaps a hundred years, he provides for keeping them anointed with a lubricant which enables them to work without sensible friction; and, in the various joints of the animal body, He provides for the inexhaustible supply of an effective lubricant. These various lubricants are material; because the conditions necessarily require a material lubricant. But a material lubricant has weight, inertia, and, therefore, resistance to material bodies passing through it. Hence, the great universal-machine required an immaterial lubricant, incapable of resistance to material bodies; for the stars and their planets have to traverse it at enormous velocities, and if they encountered the slightest resistance the machine would inevitably run down, precipitating all things into a veritable hell-fire at the center of the universe. From this final and irremediable catastrophe, the universe is saved by the strangely-peculiar qualities of the luminiferous ether. Do not all these things furnish indubitable evidence of creative design?

Let me, further, direct your attention to the simplicity of the means by which the Creator accomplishes results most varied and divergent. The ether enables gravitation to set the machine in motion; and then keeps it from running down. Gravitation furnishes the motive-power, and, with the aid of momentum, directs the heavenly bodies in their orbits; and it also acts to give them their form, to hold everything in place on their surface, and to generate vast stores of sun-heat for their use. The ether, in addition to its two functions already mentioned, serves the further purposes of conveying light and heat to the planets, and of furnishing a medium for the instant communication of intelligence over sea or land from any part of their surface to any other part. Now, was it by chance, or by *design,* that the two substances of which all nature consists, matter and ether, happened to differ from each other so radically, and yet in that very difference lay the only possibility of life and usefulness? Was it by chance, or by design, that the several qualities of the two substances happened to bear such relation to each other as to render physical life possible? Was it by chance, or by design, that the *forces* of the universe seem to have been contrived to coact with its *substances* not only to render physical life possible, but to prepare a suitable abode for it? And, finally, was physical life the grand object of the Creative plan, or merely incidental to it?

We have seen that the material universe exhibits all the characteristics of a vast mechanism, operating in absolute compliance with the laws which govern the machines that man builds; that it shows, in perfection, every conceivable indication of contrivance that can be shown in a man-made machine; and that accomplishing what man has never been able to compass in his machines, it runs by perpetual motion and, once in action, can never stop. Can there be any doubt that such a machine displays invention, design, or contrivance, and that it must have had a contriver!

To some persons—and no wonder that it is so—the vastness of its magnitude and energy, and the very perfection of its action, operate to dazzle the mental vision and obscure the judgment. Bewildered by what they see, and not observing the bodily presence of the mighty engineer who created and controls it, nor understanding the purpose for which it was created, they come to regard the universe as an inscrutable mystery, and give up the effort in despair. To such minds, there is but one thing that can clear the vision and restore the judgment; and that is, the study and contemplation of the manifold evidences of the action of intelligence and creative design or contrivance in the works of nature.

Thus we see that evidences of Divine contrivance are not found exclusively in the animate works of nature, but that they are also strikingly displayed in her inanimate works. All things together seem to testify to the existence of an intelligent Creator. How puerile are the speculations of materialism, in the presence of this great array of evidence!

CHAPTER XV.

Same Subject Continued.

To the question, What was the object or purpose of the Author of nature, that caused Him to take such infinite care in devising and building the system of worlds which we now see and in one of which we have our residence, there can be but one answer: namely, He devised and built it *for the purpose for which He is using it.* He has thus already answered the question Himself, by proceeding to carry his purpose into execution; and that answer is conclusive. It was for no purpose of display or vain-glory that He reared the great structure; for His works show that He is intensely practical, and that ostentation and vanity—the characteristics of weak and trifling minds—have no place in His nature.

Judging from the use He is making of His work, His purpose was evidently not many, but one only—the creation of a suitable abode for living beings having physical bodies. We know not for what purpose other material worlds may be used; but that is the only purpose for which *this* world is used, and it is therefore strongly indicative that it is the only purpose for which *all* material worlds are used, and the only purpose for which they were created.

We have thus a conclusive reason for believing that this world was created for the use of living beings. And we have very convincing reasons—scarcely less than conclusive—that it was created for the especial use of one particular race of living beings, Man. He alone has been endowed with the mental and physical powers necessary to enable him to take possession of it and utilize its resources. All other living beings have been disqualified from being anything else than subordinate to him—plants, by their fixedness of position; animals of all classes other than human, by their want of articulate speech, the structure of their physical organs, and the inferiority of their mental powers. It was evidently intended that Man should rule the world, and that all other created beings on this planet should bow to his will and minister to his necessities. Such is the clear teaching of nature, and such has been the universal interpretation of it by Man himself. And if beings exist on other planets, with powers similar to, or comparable with, those of man, although their physical bodies may be different from ours, it must be assumed that they, too, are, or are destined to be, the rulers of their worlds; and they are entitled to be comprehended within the term, Man, as distinctive of the highest physical embodiment of life.

On the evidence of nature herself, therefore, the universe is to be regarded as created for the special benefit of Man and his peers. That fact suffices to explain the secret of the wonderful care and labor that have been expended upon the perfecting of his physical organization. It gives the reason for providing his brain and nerve system with that exquisite telegraph and telephone combination to which our attention will be directed further on; for giving him, alone of all created beings, the ability to explore and understand the construction and operation of the universe in which he lives; for giving him, alone of all the animal kingdom, the insight to divine from the works of nature the existence of God, and to look forward to the enjoyment of eternal life in a higher state of existence, where, it is to be hoped and expected, we shall be able to enter into a more intimate association with him. This, and this alone, was apparently the Divine purpose in creating the universe, as evinced by proofs directly from His own hand.

CHAPTER XVI.

Design Manifested by the Laws of Nature.

We have found, in the construction and operation of the universe, a mechanical contrivance of infinite perfection, whose purpose, as shown by the use which its Creator is making of it, was to furnish a suitable residence for intelligent beings embodied in material form, and especially for Man. Throughout the animate works of nature, there appear everywhere, as we have seen, striking and conclusive proofs of Creative design, and of the interest which their author takes in the welfare of His creatures. The expenditure of all this care and effort in their behalf warrants the expectation that further proofs of creative design are likely to be found in connection with the equipment of man's residence for his temporary occupation as a home. We will, therefore, briefly examine planetary conditions, to see whether these expectations will be justified by any additional evidences of creative design in them.

The fixed stars are at such enormous distances from our solar system that their planets are invisible through the most powerful telescopes. Hence, for the study of planetary conditions indicating Creative design, we are limited practically to those of the Earth; for the larger planets of our system have not yet cooled sufficiently to be habitable for physical beings; the surface of Venus is obscured by a deep atmosphere and dense clouds and is only partially visible through the telescope; Mercury is too near the sun to be closely observed; and even Mars, although his surface is visible, is too far away for satisfactory study. We learn from him, however, that his conditions are quite similar to those of Earth, making due allowance for his smaller size and greater age. His surface reveals the presence of an atmosphere, water, polar snow-caps, equatorial warmth, and the regular sequence of spring, summer, autumn and winter, and gives indications of vegetation, and (as some think) of an intelligent population far in advance of man in the industrial arts. Certainly, there is no reason for believing that he is *not* so inhabited.

We are, therefore, justified in taking the conditions of Earth to be typical of those of millions of other planets unseen by us, but which must have been formed from matter by the same agencies that were employed to build up our globe, and presumably for the same purpose.

In examining into the conditions operative on Earth, our attention is attracted at once by the fact that here is another perpetual-motion mechanism, and that without it this globe would be adapted neither for animal nor for plant life. Of this mechanism, the principles of its construction are clear, and its purpose is clear. It is a mechanism for elevating water from the ocean, conveying it to the land, scattering it gently upon the land-surface, and returning to the ocean any unused residue, to be there held in readiness for indefinite future repetitions of the circulating process. It involves, besides, a vast filtration-scheme; for sea-water is poisonous to land plants, and the poison must be removed from it before it is used for irrigation.

If the man who first invented a pump had been also the first to invent a filter, and had attached his filter to his pump, so as to filter the water by the very act of raising it for use, his achievement would have been universally recognized as conclusive proof not only of the action of mind, but of a mind remarkable for its inventive powers. But millions of years before any living being had made its appearance on Earth, the Author of Nature had made that same invention —only far more perfect in operation than anything man ever made—and had put it into practical use on a world-wide scale on Earth and Mars!

Now, "nature" does not think—the rocks, the air, water, light, heat, force, do not think. You must look somewhere else than to *them* to account for any phenomenon that was clearly produced by contrivance and for a manifest purpose. An intelligent *Mind* is the only possible explanation of all such things. *Consult your own reason and common-sense* and be forever convinced of that fact. Do not allow yourself to be befogged by metaphysical sophistries nor by fine-spun theories based upon mere guesswork—even if you find them in books bearing the catchwords, "Philosophy," or "Evolution!"

If the mechanism for putting in operation the vast irrigating and filtering scheme that makes this Earth habitable were constructed in one of the forms which have become familiar to us in the little filtering and irrigating appliances made and used by man, there would never have arisen a question as to whether or not it had been contrived by an intelligent mind. But, in any of these forms, it would not have been practicable for watering the whole land-surface, and, besides, would have been bungling in construction and imperfect in operation to such a degree as to discredit the wisdom of its author. It is the very perfection of the Creator's mechanism that conceals from the common mind the fact that it is mechanism at all. There is no jar in the working of *His* machinery, to betray its artificial character. Man was on Earth thousands of years, whirling through space at the rate of a thousand miles a minute, and at the same time revolving around the terrestrial axis at the speed of a thousand miles an hour, before he ever suspected that his dwelling-place was in motion. No wonder that he has failed to be impressed with the Creator's silently-acting mechanism for circulating water from ocean to atmosphere, from atmosphere to land, and from land back to ocean!

And what a wonderful contrivance is that by means of which the water is raised out of the ocean without taking the salts up with it, is held suspended in vast quantities in the atmosphere without impairing the transparency of the air, and is shed upon the Earth's surface in refreshing drops or beautiful snow-flakes! Let us spend a few moments in the consideration of it in detail.

The effective means employed by the Creator to enable fresh water to be separated on a large scale from the surface of the salt sea, conveyed over the land, and there delivered for the use of animals and plants, is a gaseous atmosphere, overlying both the water and land surfaces of our planet, and mobile in all its parts. On the surfaces of land and sea, it presses with a weight of nearly fifteen pounds to the square inch. Its depth is usually estimated at about fifty miles, but that is evidently an underestimate, for falling meteors manifest contact with it at a much greater height.

Science informs us that it is to atmospheric pressure that we are indebted for the liquid form of water upon our globe; for, if the air were removed, evaporation would soon dry up the oceans and lakes and would leave the earth surrounded with an atmosphere of water-vapor, totally unfitted for any form of physical life now known or even conceivable.

But for land animals and plants, liquid water is as indispensable as air. Their bodies are largely composed of it, and it must, therefore, be supplied to them in ample quantities, as an aliment. Hence, in the planning and creating of the universe, two conflicting conditions presented themselves;

by one of them, the water had to be held down in its ocean bed in order to render the planets habitable; by the other, large quantities of water had to be raised from its ocean bed, purified from its salts, and distributed over the land surfaces in order to enable them to support their animal and plant inhabitants. The problem of how to satisfy both of these conflicting conditions at once, on a world-wide scale, and thus reconcile them to each other, is one which must have presented itself to the Divine mind at the very beginning of things; and its successful solution furnished us with an instance of Divine contrivance which cannot but impress us with wonder and admiration.

The Creator puts His contrivances into operation by directing the forces of nature in accordance with His plans. The "laws of nature" are *His* laws, imposed upon Himself as well as upon His universe. Hence, in solving the great problem here under consideration, He created and surrounded the planets with an atmosphere which should hold the water down in order to render them habitable, and yet elevate and convey to land a sufficient quantity of it to provide for the wants of His creatures. The *modus operandi* by which this is effected was unknown to man until less than a century ago, and was then revealed through one of the most brilliant of scientific discoveries. This was the discovery that all atoms and molecules are normally in a state of violent agitation; that the molecules of gases, liquids, and a few unstable solids, not being restrained by the force of cohesion, do actually execute bodily movements in space, thereby continually colliding with each other and with the walls and bottom of any vessel in which they may be contained; that, although the molecules of a liquid are restrained to a certain extent by their gravity and their cohesion with each other, yet these bodily movements enable them to escape from the surface of the liquid unless they are held down by superior force; that the weight of the atmosphere, resting upon a liquid, is a force sufficient, at ordinary temperatures, to prevent its surface molecules from escaping; and that the molecules of a gas, being entirely free from cohesion and each of but little weight, execute longer and more violent movements than those of a liquid.

It follows from these facts that when a gas rests upon a liquid as the air does upon the water surfaces of the globe, its lower stratum of molecules is incessantly engaged in a violent bombardment of the liquid beneath it; and that as the liquid itself is also composed of molecules, which are separated from each other by infinitesimal void spaces, the molecules of gas are able to penetrate into these inter-molecular spaces and there go on with their agitation, adding their vibrational force to that of the liquid molecules, and thus aiding the latter to escape from their confinement and soar upwards into the atmosphere, where they are free to go wherever the winds may carry them. Such is, in general terms, the process of evaporation. Heat intensifies molecular agitation, and thus facilitates evaporation. On the contrary, cold and pressure retard it; although even in the coldest days of winter the surface evaporation from the seas and lakes is still very active, sending up into the air vast quantities of water vapor.

The weight of the atmosphere aids its lower molecules to force their way into the intermolecular spaces of the water beneath; and the effect of this weight may be largely increased by subjecting the air or gas to pressure in a closed vessel. With a pressure of only seven pounds to the square inch in excess of the normal atmospheric pressure, air is driven in great quantities into water, and, in consequence of its own remarkable elasticity, is compressed to much less than its original volume. As a result, a vessel filled with water may also be practically filled with air without displacing the water, the air being compressed and forced into the intermolecular spaces of the water, where it will remain so long as the pressure is maintained, and will be entirely invisible. If any reader is not familiar with the action of gases under pressure in entering into the intermolecular spaces of a liquid, he may easily obtain visual evidence of the fact by simply uncorking a bottle of soda water and watching the bubbles of expanding gas, now liberated from pressure, rising through the liquid, sometimes with force sufficient to eject the water bodily from the bottle.

The process of evaporation, by which the surface-water is thus lifted, molecule by molecule, into the atmosphere, is a perfect filtration-process. In most solids, the cohesion of the molecules is too strong to permit any of them to be liberated by the action of surrounding gases; and, consequently, the salts and other impurities remain behind, and only the liquid goes off.

While the elevation of the water into the atmosphere is thus explained by evaporation, and its removal from over the sea is accounted for by the winds, there yet remains one thing now to be considered, namely,—the means by which the atmosphere is compelled to discharge its cargo of water-molecules upon the land or other surface below, in order that it may go back for another freight.

We have seen how the unsocial air-molecules repel each other and thus tend to fly off into space. But they cannot get very far upward, for as they rise the surrounding space increases and they become separated from each other so far that their mutual collisions are less frequent—they have now, so to speak, more elbow-room, and therefore less reason to go farther upward. Moreover, gravitation, which acts constantly upon them, tends to press them back towards earth. At a certain distance from the earth's surface, therefore, the air-pressure upward and the gravity pressure downward are in equilibrium, establishing the normal surface of the great ocean of air which surrounds our globe.

A sponge soaks up water because it is porous or full of communicating air-spaces—reduce the dimensions of the air-spaces by squeezing the sponge, and the water is displaced and flows out. In like manner, the intermolecular spaces of the atmosphere, in which are carried its invisible cargo of separate water-molecules, may be reduced, and, indeed, will necessarily be reduced by anything (such, for example, as cold or pressure) which further restricts the vibrations of the air-molecules. The invisible water-molecules are thus caused to come more frequently into contact with each other within the reduced air-spaces, and as they cohere by contact while the air-molecules do not, they gradually unite and take first the form of visible water-vapor; then, by further accretion the form of droplets or mist; and lastly, by still further accretion the form of drops or rain. The whole process may at any time be witnessed on the sides of a glass or metal vessel suddenly filled with ice-water in a warm room; almost instantly a thin film of vapor is deposited upon it, which soon thickens into droplets, and ultimately runs down in drops. The moisture thus deposited has been drawn from the air, in which it has been brought in molecular form (and therefore invisible) from the seas and lakes.

The same causes keep the air constantly in motion, conveying or discharging its cargo of water, or going back for more. Any chilling of the air over any region reduces its volume over that region, and causes the surrounding air to flow in to reëstablish the normal level; any heating of the air over a region expands its volume and causes a portion of the air above to flow off over the surrounding regions and thus restore the normal level. Heat is not the only form of force that causes this local expansion and contraction of the atmosphere.

A similar result is produced if the air become anywhere statically charged with electricity; for, in that case, the electrified air-particles more strongly repel each other, and a marked expansion of volume occurs in the air of the region affected. Unable to get relief downward or prompt relief laterally, the local swelling of the atmosphere pushes the overlying air upward, increasing the vertical height (or, in other words, *depth*) of the atmospheric ocean over the area of disturbance. At the surface of that ocean, the air thus raised above the normal level immediately begins to flow off laterally in every direction, under the influence of gravity, seeking, and after a time regaining, a level with the surrounding surface. But there is now less air over the region affected than there was originally, because a portion has been removed by the outflow; and at the surface of the earth a rapid fall of the barometer indicates what has taken place, and forebodes a storm. But as yet there is no visible change in the appearance of the atmosphere, to confirm the warning given by the barometer; the thinner air is only absorbing water below faster than usual. At length, slowly or suddenly, by causes beyond our ken, the electric charge is dissipated, and the air, resuming its normal density, becomes contracted in volume where it had recently been expanded. The result is the formation of vapor and clouds in the lower regions of the air, and the simultaneous formation of a depression in the upper surface of the atmosphere where there had recently been a swelling. The air now rushes in from all sides to fill that depression, moving in spiral lines as it descends into the saucer-shaped hollow, in accordance with the well-known laws of fluid motion. The rotary motion is communicated to the air below, and the predicted storm has now arrived "on schedule time." It is to these various disturbances of the equilibrium of the air, that we are indebted for the winds which are forever in action *somewhere*, carrying their cargo of moisture to the thirsty land.

Is it possible for anybody anywhere to contemplate the action of this great mechanism, either in its whole or its details, and especially in the combination of its whole with its details, without being impressed with the conviction that it is a wonderful manifestation of Creative design!

And see how the act of contrivance goes back to the very creation of the laws which govern the actions of matter and force, contriving that the atoms of matter shall have an unceasing and intense vibratory movement, which results in combining them into molecules and gives the molecules the ability to arrange themselves into the forms which we term gaseous, liquid, and solid; how each of these forms has its own subordinate and special laws, consistent with the general plan, but directing the action of that particular form of matter; how the special action of one form was contrived for the evident purpose of enabling it to coöperate with the special and dissimilar action of another and different form to produce important results that could not be produced by either alone; how this specialization of action, of function, and of effect, is apparent in all known combinations of matter and force; how it happens that, whenever science or accident discovers some before-unknown form of matter, or some before-unknown action of matter or force, it always turns out, upon investigation, to be entirely harmonious with all the other forms of matter and force; how, in brief, there is observable in the laws of nature the same harmony, the same adaptation of each to every part, the same coöperation of all to one common end, that we have observed in the structure and operation of the universe itself; and thus how the very laws of nature indicate Creative contrivance and the action of an infinite Mind!

In other words, see how the energy of the atoms forces them into combinations which science calls "molecules"—molecules of iron, of oxygen, of gold, of sodium, and so on—all different from each other, but capable when aggregated of assuming the three forms, gaseous, liquid, and solid; how the atomic forces producing each species of molecule are so proportioned that at a given temperature some aggregations of molecules are in the solid, some in the liquid, and some in the gaseous condition; how this divides the sea, the land, and the air from each other, assigning to each its station; how the air, which is to be the carrier, is stationed over land and water, so as to communicate with both, and is fitted for its carrying function by reason of its superior movability; how their gaseous condition keeps the air-particles apart so as to form intermolecular spaces in which the future cargo of water-molecules may be carried from sea to land; how the atomic energy of the air aids in liberating the molecules of the surface-water and causes the air to become loaded with its cargo; how the forces of heat, electricity and gravitation move the air, causing it to carry its cargo over the land and discharge it, and afterwards transport the unused residue back to the ocean again! Now, this is all one connected and coördinated series of facts, evidently contrived to work together to one particular end, the end and object of replenishing and vivifying the land. The operations of nature are not deceptive and misleading, but truthful and honest—they make known her purpose by proceeding to execute it.

But some critic may say: "You have described, not a *contrivance,* but merely the operation of fixed *laws*—all these things are brought about by the laws of nature." True, Mr. Critic, but your remark, perhaps unconsciously, is based upon a fallacy, or, at least, upon a misapplication of fact. For, in *nature,* the contrivance must be sought, not in the execution of the law, *but in the law itself.* For your benefit, let me illustrate the point by an example. The coöperative combination of a gun-barrel, gunpowder, a projectile fitted to the gun-barrel, and a firing-apparatus adapted to ignite and explode the powder, was a *contrivance,* as even *you* must admit, and conclusively proves the action of a creative mind. If that combination were brought about by the inevitable action of a *law,* it would have been none the less a contrivance; but the act of contrivance would have consisted *in framing the law* which brought the combination about. Your fallacy lies in stopping at the law, in your search for an explanation of the cause of the contrivance, without going on till you find the *Intelligence* which created the law. There is no intelligence in matter, nor in force, nor in laws; but only in Him who created them all to accomplish His eternal purpose. Nature itself has shown that the immediate purpose of that creation was the fitting up of a temporary physical residence for Man. What was the *ultimate* purpose—the purpose for which he was provided with a temporary physical residence—is known only to his Creator.

A discovery has recently been made in Germany by Professor Arthur Korn, which, if completely verified, will explain the hitherto impenetrable mystery of gravitation. It is said to have been already verified to the extent of proving experimentally, on a small scale, that his theory is right. I quote from a recent publication the following description of his discovery:

"Prof. Korn started with the assumption that gravitation is merely the result of the vibration of elastic bodies in an inelastic medium. This is a theory based on the fact that the earth, sun, and stars, all being elastic matter, are surrounded by ether, which science assumes is inelastic and incompressible.

"The machine constructed by the professor to produce 'artificial gravitation' is extremely simple. A metallic globe, fitted with a window for observation of what is going on inside it, is united by tubes with a cylinder, one end of which is closed only by a membrane. To this membrane is attached an electro motor, which, by pushing and pulling the membrane alternately, makes rapid pulsations. The metal globe contains two air-filled India rubber balls of different sizes. The larger one is fixed firmly to the inside wall of the globe. The smaller is free to move whither it likes.

"The whole apparatus is then filled with water, and the motor set to work. Each time the membrane is pressed in, the increased water pressure causes the rubber balls to contract, and each time the membrane returns to its original position the relaxed pressure of the water causes the two balls to expand. The motor is set working so quickly that these pulsations become inconceivably rapid vibrations, and the contraction and expansion of the balls is invisible to the eye. As water is practically incompressible, Prof. Korn thus obtains the conditions he needs—he has two elastic bodies vibrating in an inelastic medium.

"Then the phenomenon looked for occurs. When the vibrations attain a certain speed the smaller ball, impelled by a mysterious force, begins slowly to move through the water to the larger ball, and gradually increases its speed, exactly as the apple observed by Newton increased its speed as it fell nearer and nearer to the ground.

"So far this was merely a puzzling phenomenon. But that it was gravitation, and no other force, which drew the balls together was soon proved. Measurements showed that the bigger ball attracted the smaller exactly in accordance with Newton's law, or in inverse ratio to the square of the distance between them. It became, therefore, possible to construct an exact working model of the solar system in water, in which the planets should all move in their appointed paths without any visible support, or externally applied power."

Assuming Professor Korn's theory to be true, what a light does it shed upon the secrets of Creation! For, if it be true, the infinitesimal vibrations of the atoms and molecules which we have been considering constitute the means by which God organized the universe, set the suns, planets and nebulæ in their places, imparted to them the mighty mechanical movements that we see taking place in the stellar depths, prepared the planets for habitation by separating their seas, lands and atmosphere, and set in operation the mechanism by which the land surfaces are irrigated and thus made ready for the advent of physical life! What an infinite plan! How Godlike in its conception, how simple in its complexity, how perfect in its operation! It encompasses and includes everything belonging to inanimate nature, and stops only at the origin of what we call "life." *That* is something which no theory of matter can account for; for, as will be hereinafter shown, it is something which, at least in man, reaches forward beyond the confines of this earthly existence, and takes hold of the eternal hereafter!

CHAPTER XVII.

Evidence of Design in the Geological History of the Globe.

GEOLOGICAL PERIODS

Periods.	Vertical thickness of strata.	Certain forms of animals mentioned.
5 QUATERNARY GROUP		
Recent.	Unknown.	Man.
Pleistocene.		Horse.
4 TERTIARY GROUP		
Pliocene.	Unknown.	Pliohippus. Protohippus. Mesohippus. Hipparion.
Miocene.	Unknown.	Anchitherium. Orohippus. Eohippus.
Eocene.	Unknown.	Marsupials.
3 SECONDARY GROUP		
Cretaceous.	9,000 feet.	
Jurassic.	1,600 feet.	
Triassic.	3,000 feet.	
2 PRIMARY CROUP		
Permian.	Uncertain.	Reptiles.
Carboniferous.	28,000 feet.	Amphibians.
Devonian.	1,500 feet.	Fishes.
1 PRIMORDIAL GROUP		
Silurian.	40,000 feet.	
Cambrian.	14,600 feet.	
Huronian.	18,000 feet.	
Laurentian.	30,000 feet.	

In addition to the contrivance of a vast system of irrigation to fit our planet for the future abode of plant and animal life, other preparations on an enormous scale, and requiring for their accomplishment the lapse of an almost inconceivable time, were still necessary; for the work of getting a planet ready for its occupation as a residence for living physical beings is a work of countless ages. The atmosphere was, at first, heavily charged with sulphuric acid, as shown by the extensive deposits of sulphate of iron, sulphate of lime, and other sulphates now existing in the earth's crust; and until these were eliminated, and the air thus cleared from one of the most energetic corrosives, there was no possibility of life. It may also have been charged with nitric acid to a greater or less extent; for the derivatives of that acid are everywhere found. But its lower regions were practically loaded with carbonic acid, the heaviest of all gases, and carbon dioxide, one of the most poisonous to air-breathing animals, although necessary to plant life. This acid readily united with the lime and magnesia held in solution in the seas, and became stored up in vast deposits of lime and magnesia carbonates. On land, the plants extracted from the dioxide its carbon, and subsequently deposited it in the form of coal, leaving the nitrogen in the air to dilute it completely for breathing purposes—oxygen itself being so corrosive that if undiluted it would soon destroy everything combustible on the globe.

Our skeptical critic may, perhaps, interpose the objection that all this is guesswork, and, besides, that, if it be true, it does not prove the action of Creative design. But the limestone, dolomite, sulphates, nitrates and coal are not guesswork, and their existence in the crust of the earth all over the globe can be accounted for on no other theory than that above stated. The action of the plants in extracting carbon from the air, of the animalculæ in extracting carbonate of lime from the water, and of running water in forming stalactites and stalagmites in the caves, are matters of actual observation. Thus, the facts stated are beyond the reach of criticism. As for the inference that such facts, in view of their inevitable results, are evidential of the Creator's design, that is a matter of opinion. It may be unhesitatingly admitted that if considered by themselves alone they do not *prove* design. But they are *consistent* with it; and, after all that we have seen of Creative design in the construction of the universe, the forming of planetary systems, the contrivance of the laws of nature, and the creation of a vast mechanism on this planet and Mars for the obvious purpose of preparing their land-surfaces for the coming of vegetable and animal life, I think that the facts stated in this chapter may be regarded as confirmatory of the theory of design, and that it is at least incumbent on our critic to show that the contrary opinion would be the more reasonable.

Proceeding, therefore, we will consider what happened in the vast Laurentian, Huronian, Cambrian, Silurian and Devonian periods, during which the earth's crust was hardened into solid granite, then torn by the terrific action of the heated gases and vapors from below and its surface partly disintegrated by the acid torrents falling from above. It was during these long periods that the slow contraction of the earth's mass by radiation of its heat into space first wrinkled its surface into mountainous elevations and hollowed out beds for the oceans and seas. The temperature of the atmosphere was high, its depth greater than now, and it was charged with dense vapors and clouds. The precipitation must have been enormous, and the disintegration of the land-surfaces into sediment correspondingly great. The sedimentary deposits of those first five geological periods—matter washed down from the land and deposited in the seas and lakes—are over one hundred thousand feet in vertical thickness. Several times did the land and the water surfaces exchange places, through the titanic action of the subterranean forces, as is most clearly proved by geological evidence.

Thus the sedimentary deposits that had been washed down into the sea became elevated into land-surfaces, again to be partially carried down into the sea together with freshly-eroded matter—and this process was repeated over and over. During all the time that the land was under the ocean, there was, of course, no disintegration and removal of its surface as when exposed to the air, but, on the contrary, a constant and slow accretion upon it, caused by the arrival of sediment from the dry land. As the time during which any large area of land was under water was probably as long as the time during which it was above water, and possibly many times longer, the accumulation of the 100,000 feet of sedimentary rock at present out of water was not continuous, and the time necessary to effect it cannot even be approximated with any certainty by the most careful estimate. It must have been at least many many millions of years.

During all this long period, living forms on the earth had advanced no higher there than the fish stage of development; but the waters were teeming with fish, whose skeletons became accidentally buried in great numbers in the ooze of the sea-bottom and in the sedimentary deposits near the shores of the sea and lakes. These deposits were ages ago hardened into solid rock, and raised above the water by the gradual rising of the land; and their fossil remains tell us the story of Earth's earliest life-ages. It was written on tablets of stone as if by the hand of the Creator himself.

In the succeeding Carboniferous and Permian periods, amphibians and reptiles made their appearance; and their life-history was written and sealed up in the rocks, for the benefit of future ages. The climate was still warm and moist, conditions most favorable to a luxurious vegetation. Dense forests appeared. Hurricanes overthrew the trees from time to time; torrential rains swept their fallen trunks and branches into the swamps and lakes, and covered them up with sand and sediment. In other places swamps of large extent were filled up with decaying foliage and afterwards buried in the same way. In the slow course of time, gravel, sand and mud, hundreds, and in some instances thousands, of feet deep were accumulated upon the buried vegetation, excluding the air and forming a veritable oven or retort in which the vegetable mass was cooked under enormous pressure for ages. In the fulness of time, Man appeared on the scene, and gaining slowly in knowledge, at last reached a stage of civilization in which his spreading industries were checked through want of fuel to heat his furnaces and generate his steam. At precisely this juncture, the earth opened its treasures of coal, and, a few years later, its stores of petroleum and gas, generated in Nature's retort for man's use.

Following the close of the Permian period, came successively the Triassic, Jurassic and Cretaceous periods—periods which, in their totality, must have occupied many millions of years. The earth not being yet ready for occupation by man, and many further improvements being necessary before it would be ready, Evolution seems to have been given permission to amuse herself by whiling away her time in developing her Permian reptiles into vast Triassic and Jurassic monstrosities, reptiles of such enormous size and grotesqueness that we could not believe they ever existed were it not for the fact that their fossil skeletons are occasionally found in the rocks. But there was to be an end to all this: the deluge was on its way—not the Noachian deluge, a modern affair and mythical at that, but a real deluge, which lasted for ages, and seems to have wiped out all existing forms of animal life except a few fishes and lizards. It was accompanied, at least in the northern hemisphere, by intense cold, and would therefore appear to have been caused by the recurrence of one of those great ice-ages, of which we have often heard. Professor Croll, from astronomical data, sets the last great ice-age at about 250,000 years ago, or practically coincident with the close of the Tertiary period; and the last preceding one, the most remarkable of all, at a date about 4,000,000 years earlier. This may have been the great deluge of Cretaceous times, which at the close of the Cretaceous period gave way for the advent of the Eocene period, with its birds, marsupials and inchoate horses, and opened the road along which Man was to come some four million years later. Of course, we cannot fix these dates with certainty—the most that can be said is that, from all known data, they appear to be approximately correct. All that we know about it is, that the greatest of all the ice-ages appears to have been between four and five million years ago; that there have been several others, of which the last was at the close of the Tertiary age, and, from astronomical data, appears to have begun 250,000 years ago and ended about 80,000 years ago; that there was evidently a long and severe refrigeration of the northern hemisphere in the Cretaceous period, which practically closed the old chapter of life-history on this planet and opened a new one; and that the period of 4,000,000 years from the great ice-age to the end of the Tertiary is apparently in substantial agreement both with Mr. Croll and Geology.

The purification of the earth's atmosphere by separating and storing up its sulphur and carbon in the ground; the vast deposits of coal and petroleum laid away and covered up during the long carboniferous period, as if for the use of man in the far-distant future; and the making of a permanent stone record of the earth's life-history and of the geological events that have occurred since the planet became covered with a hard crust; are the facts of chief interest in the long category briefly sketched above. As already remarked, they do not prove design but they are consistent with it, and, in connection with the many conclusive evidences of Creative contrivance to which our attention has been directed, they are particularly significant of God's paternal interest in Man. It matters not to the dumb beast that treasures of coal, iron, and petroleum are laid up in the crust of the earth; for he could not use them even if he knew of it; nor that an authentic history of the globe has been graven upon imperishable tablets and left accessible to all who can decipher the inscription; for he never can read it; nor that a revelation of God's existence has been written in nature and nature's laws; for he is as incapable of conceiving it as of conceiving the grandeur of Niagara or the beauty of a glorious sunset. All these things are for man alone.

Thus, in a general review of nature's works, we find them eloquent of creative design—eloquent most strangely and inexplicably, if we are to assume that there was, as a matter of fact, no design whatever in nature or nature's works. How is it that we find everywhere in nature the most amazing displays of mechanical contrivance, if there was no design involved in it? How was it that nature could create, in the rattlesnake, a most complicated and elaborate mechanism (1) in order to utilize a liquid poison for a certain purpose; at the same time, and in the same animal, create another complicated and elaborate mechanism (2) for distilling such a poison; also, at the same time and in the same animal, create a third mechanism (3) for the self-evident purpose of storing up that poison till it should be needed and then delivering it from its storehouse for use; also (4) connect mechanism (1) and mechanism (3) so that they could coöperate together to discharge the poison formed by mechanism (2) into a wound made by mechanism (1); and finally, by a special mechanism (5) created exclusively for the purpose could put under the control of the animal's brain, the power successfully to operate the whole, so that the animal could, at will, by mechanism (1) inflict the wound, and could, simultaneously by mechanism (5) direct mechanism (3) to coöperate in that particular act or not—and all this without the exercise of the mental faculty of contrivance or design? There is no possible question about the facts—the only question is: Do these facts prove design or not? If they do not, then human reason is worthless; if they do, then God created and governs the universe. I see no possible escape from this conclusion.

And this conclusion explains all the other instances of mechanical or chemical contrivance that we see in nature's works. It explains the vast mechanism that formed and guides the suns and their planets; the lesser, but still vast, mechanism that prepared this planet and Mars, and probably thousands or millions of unseen planets, for their occupation by intelligent physical beings; and the apparent purpose of the storing up, in the crust of the earth, of the supplies of coal, iron, and petroleum, et cetera, that we find so serviceable, and of the preparation and preservation of materials from which to learn the geological and life history of the planet on which we live. When we contemplate the universe itself, we are constrained to exclaim, with Pope, that

> "All are but parts of one stupendous whole,
> Whose body nature is, and God, the soul";

but when we see in it and its laws indubitable proofs of contrivance in both, we recognize in nature, not the body of the Deity, but an inscrutable Divine purpose connected in some way with Man.

CHAPTER XVIII.

Science Unable to Meet These Proofs.

There are those who mistakenly suppose that science has successfully met and controverted all of the arguments and proofs outlined in the preceding pages. Nothing could be farther from the truth. Science has furnished these proofs and arguments instead of controverting them. Science does not, as yet, deal with Religion or the things of the spirit, but restricts itself to the study of the phenomena of nature, endeavoring to ascertain what are the actual facts of nature, proved or provable. It is indifferent to the theological consequences of those facts, leaving all questions of that kind to be investigated and determined by other departments of learning. Within its own field of research it rigidly requires that things are not to be accepted as true until they have been proved to be true; outside of its own field of research it has nothing to say. When, therefore, a scientist professes to accept or reject any theological belief or opinion, he does it, not in the name of science, but as a private individual, for whose opinions on such subjects science assumes no responsibility.

The existence of God is a subject which is manifestly not directly within the purview of scientific research. But if the facts of nature, as verified by science, are such that they clearly and unmistakably show that their original production involved the exercise of the mental faculty of contrivance or invention, then the existence of an intelligent Creator is positively proved by them, and science, which has investigated and verified the proofs, is bound to accept it as a final conclusion of the question.

I have taken as the basis of this argument, facts absolutely verified by scientific research. Any person who possessess ordinary intelligence can see that they prove contrivance and the existence of God as the contriver—unless, indeed, they can one and all be fully accounted for on some other reasonable hypothesis.

A few persons profess to believe that they are due to natural causes alone—to something termed *Evolution*. Unfortunately the word evolution, as applied with relation to nature's work, has come to be used with two very different meanings. In the popular acceptance of the term for the last fifty years, it means the theory proposed by Charles Darwin, that the animal and plant species have, through individual growth and development, gradually evolved from their primordial life-germ or germs and become differentiated into species and genera; and that heredity, a natural tendency to slight successive variations, the influence of their environment, and the survival of the fittest, are the causes which have differentiated them from each other. Prior to 1857, and by careless writers and speakers since, the term *Evolution,* as applied to the works of nature, was not restricted to animals and plants, but embraced everything in the universe,—suns and planets, nebulæ and comets, as well as living things. "Evolution," as applied in the broad sense last referred to, assumes the eternal duration of matter and force, and the "spontaneous generation" of all natural forms of non-living matter, as well as life itself and the primordial germs of life; and thus rejects the idea of God, as being a mere survival of the superstitions of ancient ignorance. As applied, however, in the sense first referred to—the sense of "Darwinism"—it does not assume to account for the origin of life as a natural phenomenon, nor does it reject the idea of God, the Creator, as inconsistent with intelligent belief.

No one would have been more surprised than Darwin himself to be told that the principle of evolution to which he gave the support of his great authority blots out God from the universe, and installs in His place mere blind matter and force. He expressly recognized "life with its several powers" as "having been originally breathed by the Creator into a few forms or into one," and the so-called laws of nature as "laws impressed on matter by the Creator." In giving his theory of the origin of species the broadest expression of its principle, he characterized it as "Growth with Reproduction." He made no pretensions that his theory embraced anything other than living animals and plants.

Darwin was not an atheist. He believed that God was the author of life, and that Evolution was merely the mode in which He chose to develop the present forms of animal and plant life from past forms. The last words of his great work on "The Origin of Species" were as follows:

"Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms, or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved."

And he says, a few pages earlier: "Science as yet throws no light on the far higher problem of the essence or origin of life."

Huxley, the great protagonist of the Darwinian theory, and one of the ablest scientists of modern times, did not endorse Darwin's opinions in all respects. Whatever views he may have held as to the existence of God or the origin of life, he effectually concealed them by avoiding public discussion on those subjects, and by calling himself, as to all theological questions, an agnostic or "know-nothing." He admitted "the strong conviction that the cosmic process is rational, and the faith that, throughout all duration, unbroken order has reigned in the universe"; and several times expressed his opinion that a belief in God is not logically antagonistic to evolution.[1] The main points on which he differed from his friend Darwin, were, (1) whether nature does not sometimes, in the development of animal or plant species, take a sudden jump from one stage of evolution to another, instead of bridging-over the intervening space by a consecutive series of slight modifications; and (2) whether the successive advances in the development of an animal or plant species are connected or discrete—that is to say, whether each advance holds to the next preceding one the relation of effect to cause or, on the other hand, may be due to a cause entirely independent of the preceding advance. This view he expressed as follows: "When I speak of transition I do not in the least mean to say that one species turned into a second to develop thereafter into a third. What I mean is, that the characters of the second are intermediate between those of the two others. It is as if I were to say that such and such a cathedral, Canterbury for example, is a transition between York minster and Westminster Abbey. No one would imagine on hearing the word transition, that a transmutation of these buildings actually took place from one into another."[1]

[1] *Life of Huxley,* by his son, Vol. 2, pp. 316, 320, 321.
[1] *Life of Huxley,* by his son, Vol. II, p. 428.

On the other point, he wrote as follows to Mr. Bateson, February 20, 1894: "I see you are inclined to advocate the possibility of considerable 'saltus' [2] on the part of Dame Nature in her variations. I always took the same view, much to Mr. Darwin's disgust, and we used to debate it."[3] He was also less confident than Darwin of the all-important part played by "natural selection" in the differentiation of species.[4]

Thus, the man who was the original propounder of the Darwinian theory, and the man who was its foremost and far-ablest advocate and defender, each of them learned, incapable of a false suggestion and seeking only the discovery and dissemination of scientific truth, were considerably at variance on vital matters involved in that theory; and united only in the belief that, in the growth and development of animals and plants from their primordial life-germ to their present conditions, evolution has played a conspicuous part. Other leading evolutionists are in substantial accordance with them, both as to the truth of the main proposition and as to the inherent difficulties encountered in all attempts to establish it by conclusive evidence. These difficulties are four in number, and some of them seem insuperable. First: There are wide gaps in the chain of evidence. Its links do not connect with each other, and there is no way of bridging the chasm except by unproved assumption—and assumption in place of evidence is abhorrent to the scientific mind. There are gaps of millions of years in the succession of evolutionary steps. Second: There are known facts which evolution cannot rationally account for—innumerable ones. Third: There

[2] Saltus, a jump.
[3] *Life of Huxley*, p. 394.
[4] Wilson's *Chapters on Evolution*, p. 6.

are evidences of some unknown but deeper and more far-reaching principle underlying that of evolution—some unknown cause operating to disturb and thwart all calculation. Fourth: Lateral buds suddenly appear, without any apparent cause, on the trunk or branches of the evolutionary tree of life, and proceed to develop into new and divergent forms.

The progress of life along the path of development has not been at a uniform rate, but has been subject to great irregularities of movement. One of the ablest authorities on the subject, a pronounced evolutionist, Nicholson, says (*Ancient Life History,* p. 373): "On the other hand, there are facts which point clearly to the existence of some law other than that of Evolution, and probably of a deeper and more far-reaching character. Upon no theory of evolution can we find a satisfactory explanation for the constant introduction throughout geological time of new forms of life, which do not appear to have been preceded by pre-existent allied types. The Graptolites and Trilobites have no known predecessors, and leave no known successors. The Insects appear suddenly in the Devonian, and the Arachnidæ and Myriapods in the Carboniferous, under well-differentiated and highly specialized types. The Dibranchiate Cephalopods appear with equal suddenness in the older Mesozoic deposits and no known type of the Palæozoic period can be pointed to as a possible ancestor. The *Hippuritidæ* of the Cretaceous burst into a varied life to all appearances immediately after their first introduction. The wonderful Dicotyledonous flora of the upper Cretaceous period similarly surprises us without any prophetic annunciation from the older Jurassic.

"Many other instances could be given; but enough has been said to show that there is a good deal to be said on both sides and that the problem is one environed with profound difficulties."

Le Conte, who when living, was one of the foremost American exponents of evolution, says (*Evolution,* p. 76): "The great objections to the sufficiency of the theory of evolution, as left by Darwin, are two-fold: (1) While natural selection accounts completely for the formation of *useful* structures or adaptive modifications, and therefore for differences characterizing classes, orders, families, and even genera—for all these are all adaptive—it can not completely account for those constituting species; for these consist mostly of *trivial* differences of coloration, relative proportion of parts, which are of *no perceivable use* in the struggle for life, and therefore could not be preserved and integrated by natural selections. Therefore, according to Romanes, natural selection is a theory of origin of adaptive structures rather than of origin of species. Comparing to a growing tree, once admit lateral buds started, and natural selection completely accounts for the growth in different directions, and therefore for the profuse ramifications; but *the origin of the lateral buds is not explained.*"

This is a point to which I have repeatedly called attention hereinbefore while discussing the appearance in various animals and plants of new structures and new functions that cannot be accounted for on the Darwinian theory. It is impossible to exaggerate the importance of the fact; for if even a single instance of the sudden appearance and perpetuation of a new form be established beyond controversy, then evolution alone is no longer sufficient to account for the origin of species, or of races; then the hypothesis of "missing links" is no longer necessary to explain the development of animal or plant life; then the oft repeated excuse that the great gaps plainly observable in the geological sequence of development are merely due to accidental defects in the record and not to any irregularity in the sequence itself, is no longer tenable.

Such an instance has already appeared. I will let Wilson tell the story, for he is an enthusiastic evolutionist, who will not be charged with any secret hostility to Mr. Darwin's theory, and his testimony is supplemented by that of Huxley, the foremost champion of that theory. He gives the facts as follows ("Chapters on Evolution," pp. 147, 148):

"Nor must we forget one all-important consideration, which, according to Professor Huxley, Mr. Darwin himself somewhat overlooked. It is a frequent fact, hereafter to be noted, that, despite the Linnaean aphorism *Natura non facit saltum,*[1] Nature may and sometimes does take not merely a jump, but a running leap from one species to another. What would be thought of the history of the Ancon or Otter sheep, which about the close of the last century[2] was born of an ordinary ewe as the progeny of an equally commonplace male parent: both, along with fourteen other ewes, having been the property of a certain Seth Wright, a Massachusettts farmer? This Ancon sheep differed most materially from its parents and from the ovine race at large, in possessing a large body and proportionately short legs. For sundry reasons connected with the over-lively habits of his long-legged sheep in leaping over their fences, Wright from this one Ancon sheep, in due time, bred a whole flock of pure Otter sheep; the breed being allowed to die out in the introduction of the Merino sheep. Presuming that, in ignorance of its true and sudden origin, the history of the Ancon breed had been made the subject of biological speculation, how would the demand for 'miss-

[1] Nature does not make a jump.
[2] The eighteenth century.

ing links,' and the evolutionist's inability to reply to the demand, have been construed? Simply as against the transmutation of the sheep species of race, and as against the origin of the Ancon by the variation and modification of the ordinary sheep. And yet the Ancon race had certainly its beginning in the sudden modification of an existing race such as utterly precluded the possibility of any 'connecting links' having been developed and required."

Many other instances have been known, where, in the course of regular generations, new organs and forms have suddenly and unaccountably appeared. For example, probably one man in every million has six fingers on each hand, or six toes on each foot; although, for millions of years in the past, the general rule, both for man and monkey, was to allow but five digits on each limb. These superfluous fingers or toes tend to appear in the same families or their descendants, evincing an effort of Nature, partially successful, to transmit them by heredity. In other instances, Nature has developed two hearts, or other unusual number of organs. Various "monstrosities," so-called because they are out of the usual order of nature, also appear.

These phenomena, inexplicable on the Darwinian Theory, have now, fifty years after the publication of "The Origin of Species," become so well-known, and are so obviously hostile to one of the fundamental assumptions of that theory, that Darwinians have been put to it to invent some new hypothesis by which to explain them. Darwin's explanation of heredity by *pangenesis*[1] would not answer the purpose; because it is inconsistent with abrupt variations from the

[1] *Pangenesis:* The hypothesis that the characteristics of both parents are transmitted to the child by means of material atoms, derived from each cell in both parents, and developed in the child. It assumes that the reproductive cell is made up of minute units derived from and representing each part or organ of the entire body.

parental form, and therefore cannot account for lateral buds on the family tree. Hence arose DeVries' hypothesis of *mutations*,[1] published in 1892—a hypothesis invented for the purpose of supplying the defect in Darwin's pangenesis hypothesis. But the whole thing, including both pangenesis and mutations, is mere speculation and guess work, which will probably be superseded within a few years by some other ingenious hypothesis. Its main interest to us, in the present discussion, lies in the fact that the exponents of Darwinism are obliged to admit that nature does sometimes make "jumps," and that they have not been able to agree among themselves upon any hypothesis by which to explain them.

Not only has evolution failed to account for the *appearance* of structures and forms through the agency of natural selection, but it has been equally unable to account for the *disappearance* of useful structures in plain violation of Darwin's laws. (See *Ante,* Chapter 11, Wilson's compendium of Darwin's Theory—paragraph "Sixthly"). There are several instances where useful organs have become atrophied, or have disappeared from the species in direct violation of the laws of evolution. Thus Wilson says ("Chapters on Evolution," Am. Ed. p. 362):

"In most snakes only one lung is fully developed as a rule, the companion organ being rudimentary and degenerate. In birds the egg-producing organs are similarly developed on one side only. How degeneration should be thus partial, and affect one-half of an animal's frame, so to speak,

Mutation: The hypothesis that the germ cell or plasm contains ''unit characters'' which determine the characteristics of the offspring; and that by the acquisition or loss of one or more of the unit characters the offspring and its progeny may exhibit characteristics not found in either of its parents. This hypothesis, therefore, aims to provide for abrupt breaks in the continuity of the line of descent, as well as for the gradual variation of its characteristics.

is very hard to discover. External conditions of life and the influence of surroundings could apparently possess little effect in producing such an unsymmetrical retrogression of parts. Most probably we shall find the solution of such conditions to exist within the operation of some deepseated law of the living constitution, and in the effects of that law in moulding or even contorting the animal."

Here is the second time that the principle of natural selection has proved itself unable to account for developmental facts and that the evolutionist has been compelled to assume the existence of a deeper and more far-reaching law than evolution, in order to explain them; the first time, it was necessary in order to explain the appearance of new structures; the second time, in order to explain the disappearance of old structures. In view of these facts, it is obvious that there are serious defects and insufficiencies in the doctrine of Evolution that gravely impair its authority and weaken its hold upon our credulity. In view of all these facts, it can only be said that, whilst Darwin's theory is the best theory of evolution that has been hitherto put forth for public acceptance, yet it is manifestly subject to grave defects and uncertainties, and that the world still waits for a theory which will reconcile everything in Nature.

Logically, the radical defect of the Darwinian theory is that its facts are not sequentially coherent, but have to be pieced together by intervening assumptions or guesses. It is an ascending stairway from monad to man, in which the "treads" are facts, and the "risers" assumptions. Between every two proximate facts there stands an assumption or guess upon which rests the more elevated of the two facts, with no other support. Remove the assumptions, and the facts float upon air. Thus, in the ascending stairway of Darwinism, the reptile functionates as one of the steps, and the mammal as the next step above; and there is nothing so connect them, except a mere guess that the mammal was in some unknown way evolved out of the reptile, and is his legitimate successor and heir. It is obvious that such a stairway affords a very uncertain means of ascent. But, as if to render it still more uncertain, here comes Mr. Huxley, the foremost disciple of Darwin, and declares that there is no connection whatever between the two steps—that mammal did not grow out of reptile, any more than Westminster Abbey grew out of York Cathedral—and gives us to understand that the relationship is simply that of sequence in time. Well may one exclaim: What *is* the truth that lies at the bottom of this well of speculative opinion?

There is at least this truth in the speculations of Darwin—the truth that slight variations between parents and offspring normally occur, and that the cumulative effects of successive variations may, in some instances, become important. Such variation is normal—at all events, with sexual reproduction—in consequence of the offspring inheriting the peculiarities of both parents, and being therefore, so to speak, a literal copy of neither. Even in asexual reproduction, variation may probably occur through the influence of environment upon the parent.[1] But, as we have seen in the case of the Ancon sheep, sudden and wide variations sometimes occur, that are not due to any known cause, and are not in harmony with Mr. Darwin's theory. No known or even hypothetical scientific law accounts for them. It is just as reasonable to assume that the wide gulf between reptile and mammal was bridged by one of these sudden

[1] I make no account of the influence of the mother's imagination upon the unborn child, resulting in birth-marks, monstrosities, etc., since these malformations are not, so far as I am informed, handed on to the child's posterity.

and unaccountable variations, as it is to suppose that it was caused by the slow progressive cumulation of thousands of slight changes of form and structure. Indeed, knowing that such "jumps" do occur, and more than one of them has occurred in recent times, it is far more probable that many of them occurred in the long period—millions of years—between the reptilian and the mammalian ages than that none occurred. These "jumps" would completely account for all the "buds" that have appeared on the tree of life in past ages; but they destroy the credibility of Mr. Darwin's theory as a theory which undertakes to explain the ascent of man from monad as resulting from evolution alone. And the uncertainty with which they affect the reasoning mind as to the substantial verity of his theory is increased by the many other discrepancies between that theory and known facts; for example, that organs have disappeared from birds and snakes in direct violation of the fundamental principles of his theory.

But Mr. Darwin's theory must be accepted as the best guess yet made upon the subject of the development of animals and plants—the best, because it is, at least, partially supported by fact. Nobody can doubt that environment, the progressive cumulation of slight natural variations, heredity, and the sifting-out effect of what he calls "natural selection," have had an important influence on the production of the results which we see around us. To have discovered the correlation and meaning of these truths is enough to entitle him to immortality, as a thinker and a man of science, even though they have no bearing upon the deeper problems of human life.

The second and broader theory of evolution above referred to, does not, like the Darwinian theory content itself with trying to explain the development of animal and plant forms, but boldly assumes that all forms of matter, living and non-living, are the outgrowths of evolution. It looks upon matter and force as having, from eternity, contained "the promise and the potency" of all things that were to come. Its votaries constitute the class to which I have several times referred as "ultra-evolutionists" or "radical evolutionists."

Since the year 1859, supporters of this form of evolution have generally adopted Darwin's theory as a subordinate portion of their cult; and from this circumstance has arisen much confusion in the public mind as to what "Darwinism" really means. There is no law to prevent a person who believes in "spontaneous generation" from calling himself a disciple of Darwin, nor even from doing, like Professor Haeckel, important scientific work in support of Darwin's theory of the development of animals and plants; but it is not surprising that thousands should be led by the union of such beliefs, in the persons of distinguished scientific men, to ascribe to the Darwinian Theory teachings far more radical than that of the natural transition of species. Yet, in brief terms, the natural transition of species comprehends all there is in "Darwinism."

The distinguishing features characteristic of the school of ultra-evolutionists, are (1) that they believe that life on this planet originated by what they call "spontaneous generation"; (2) that they deny that matter and force were created and affirm them to be self-existent; and (3) that they hold evolution to be the general law of the universe. None of these three features has a place in Darwinism, nor any place in science. They are mere idle speculation. If they were true, they could neither be proved nor disproved. There is no evidence even tending to prove them. Hence, they do not rise to the dignity of a theory; for science does not recognize guesses and speculations as "theories," unless they are founded upon evidence which gives them at least an appearance of probability.

The leading exponent of the ultra-evolutionists is Professor Ernst Haeckel, of the University of Jena. In his work on "The Evolution of Man," Vol. 2, pp. 30, 31, 32, (Appleton's Am. Edition), he gives a condensed statement of what he understands the term "spontaneous generation" to imply. I will quote the whole of it here, in order that my readers may see, from his own hand, upon what a fantastic structure of mere guesses and assumptions he takes his stand as the trumpeter of ultra-evolution. He says:

"Here I will only say a few words on the obscure question as to the first origin of life, and will answer it so far as it concerns our radical conception of the history of organic evolution. In the definite, limited sense in which I maintain spontaneous generation (*generatio spontanea*) and assume it as a necessary hypothesis in explanation of the first beginning of life upon the earth, it merely implies the origin of Monera from inorganic carbon compounds. When animated bodies first appeared on our planet, previously without life, there must, in the first place, have been formed, (notice the assumption, "must have been formed"), by a process purely chemical, from purely inorganic carbon combinations, that very complex nitrogenized carbon compound which we call plasson, or "primitive slime," and which is the oldest material substance in which all vital activities are embodied. In the lowest depths of the sea such homogeneous amorphous protoplasm probably still lives, in its simplest character, under the name of Bathybius. Each individual living particle of this structureless mass is called Moneron. The oldest Monera originated in the sea by spontaneous generation, just as crystals form in the matrix.

This assumption is required by the demand of the human understanding for causality. For when, on the one hand, we reflect that the whole inorganic history of the earth proceeds in accordance with mechanical laws and without any intervention by creative power, and when, on the other hand, we consider that the entire organic history of the world is also determined by similar mechanical laws; when we see that no supernatural interference by a creative power is needed for the production of the various organisms; then it is certainly quite inconsistent to assume such supernatural creative interference for the first production of life upon our globe. At all events we, as investigators of nature, are bound at least to attempt a natural explanation.

"At present, the much agitated question of spontaneous generation appears very intricate, because a large number of very different, and in part quite absurd, conceptions are included under the term "spontaneous generation," and because some have supposed that the problem could be solved by the crudest experiments. The doctrine of spontaneous generation cannot be experimentally refuted. For each experiment with a negative result merely proves that under the condition (always very artificial) supplied by us, no organism has been produced from inorganic combinations. Neither can the theory of spontaneous generation be experimentally proved unless great difficulties are overcome; and even if in our own time Monera were produced daily by spontaneous generation—as is very possible—yet the absolute empiric proof of this fact would be extremely difficult—indeed, in most cases impossible. He, however, who does not assume a spontaneous generation of Monera, in the sense here indicated, to explain the first origin of life upon the earth, has no other resource but to believe in a supernatural miracle; and this, in fact, is the questionable standpoint still taken by many so-called 'exact naturalists,' who thus renounce their own reason."

The above exposition of Professor Haeckel's spontaneous generation doctrine and his reasons for publishing it to the world, is one of the most curious things that I have ever found in a grave scientific work—suggesting rather the exuberant fancy of a Shakespeare than the profound cogitation of a philosopher or scientist. His "Monera" (which he elsewhere refers to as "structureless organisms without organs," p. 38) were as purely imaginary as Puck or Ariel. His "Bathybius," upon being subjected to chemical tests, was proved to be nothing more than a lifeless inorganic mud or ooze, at the humiliating exposure of which an unfeeling scientific world has hardly yet ceased laughing.[1] His reasons for publishing to the world his spontaneous generation guess are, that it is "inconsistent to assume" creative interference for the first production of life upon our globe, and therefore that "at all events we (the scientists), as investigators of nature, are bound at least to attempt a natural explanation." The illogical character of his reasoning becomes still more obvious when we read (at the bottom of p. 27 of the same work) an affirmation "that the oldest ancestors of the human race (as of the whole animal kingdom) were simple amœboid cells," and, on p. 33, read that "even in the production of the simplest cell we must not assume the process of spontaneous generation. For even the simplest cell consists of at least two distinct constituent

[1] From erroneous reports, even the cautious and circumspect Huxley was fooled into believing that Bathybius was a living substance; but after chemistry had proved that it was not, he publicly retracted that opinion, and privately acknowledged himself very much ashamed of it. But he never believed it to have any bearing on the origin of life, nor on the Darwinian Theory. (*Life*, Vol. 2.)

parts: the inner and firmer kernel (nucleus), and the softer cell-substance or protoplasm."

I have already (*ch. III.*) referred to the chemical impossibility of spontaneous generation. Fully convinced of such impossibility, Sir William Thomson (Lord Kelvin) suggested, many years ago, that life may have been brought to the earth from some other planet, upon or in a meteoric fragment projected from its surface by volcanic action or otherwise. How any living thing could withstand the heat of a volcano, the shock of such an explosion, and a long journey through the intense cold of space (more than 400° below zero, F.), all acting in immediate sequence, has never been explained. The absurd conjecture no longer has any supporters. Within a year or two past, Professor Svante Arrhenius, of the Physico-Chemical Nobel Institute at Stockholm, has suggested that life-germs almost infinitesimally smaller in size and weight than an atom of hydrogen (the lightest physical substance known) might be driven through space by the impact of electrons shot off from the sun, and might have brought life with them. But we know of no such infinitesimal life-germs; all naturalists agree that the smallest living thing known is at least as large as a cell—and a cell contains millions of atoms. Then, too, there are the same serious difficulties that wrecked Lord Kelvin's meteoric hypothesis. So the Arrhenian hypothesis cannot be pleaded as an argument against the creative power of the Almighty—at least not at present, nor until some of the supposed infinitesimal life-germs shall have been corraled, examined, and duly certified. Nor, if the speculative hypotheses of Lord Kelvin and Arrhenius were admitted to be true, would they account for the origin of life, but only for its transportation from some other planet to this.

In short, there is nothing known which justifies the sceptic's hope that science will ever be able to answer or explain away the clearly-conclusive proofs of God's existence and Creative power. Every new discovery of science, when it comes to be fully understood, only adds to the number of these proofs. The evidence is a thousand times stronger today than in Paley's time, because science knows a thousand times more now than it did then. Not the least of what it now knows is its own powerlessness to meet nature's proofs of God.

CHAPTER XIX.

The Human Brain.

The crowning evidence of Creative intelligence in the planning and construction of man's physical body is furnished in the human brain. It is not possible adequately to describe the marvels of inventive ingenuity and constructive skill exhibited in that organ, which surpasses beyond comparison or even conception all the inventions of man and, if one may say it without irreverence, seems to have been intended as God's masterpiece of creative contrivance. It is the organ through which the mind communicates with the surrounding world—the temporary residence of the human soul—and the wonderful care displayed in fitting it up for such residence attests in the highest degree the dignity of its illustrious occupant.

The brain is a large organ, consisting of several connected parts or divisions, of which the three principal ones are the cerebrum, or upper and anterior portion, the cerebellum, or lower and posterior portion, and the portion called the *medulla oblongata,* which is continuous with the upper end of the spinal cord and has not inaptly been called the "brain-stem," and sometimes the "bulb." The brain, spinal cord and nerves are each composed of two different substances, which, from their color, have come to be known as gray matter and white matter—the white matter largely predominating.

The cerebrum constitutes about seven-eights of the brain-structure, and is formed in two equal divisions termed the right and left hemispheres.

At the bottom of the narrow space intervening between them, is the *corpus callosum,* a body of white matter about four inches in length, whose functions are unknown. From the fact that in several instances it has been found after death to have been entirely wanting, and yet the decedent, during life, had given no indication that anything was wrong with his brain, it may be assumed for the pur-

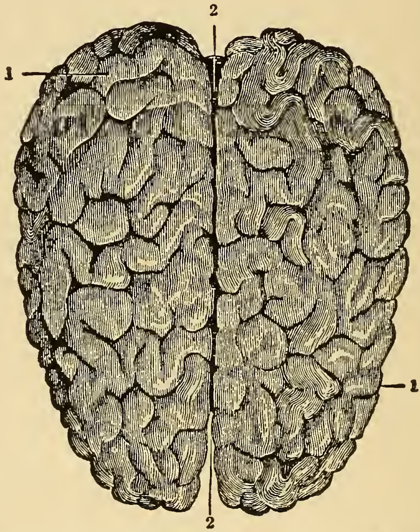

Fig. 17.—View of the Top of the Brain. 1, 1.—Hemispheres. 2, 2,—Longitudinal fissure.

poses of this discussion that it is a mere spacing-block to prevent the two hemispheres from contact with each other. The interior of the two hemispheres is composed of white matter, and is covered with a bark or "cortex" of gray matter about one-tenth of an inch in thickness. The cerebrum is so formed that its surface exhibits irregular ridges and folds termed "convolutions"—an arrangement which more than doubles the superficial extent of the cortex. As seen under the microscope, the white matter is composed of exceedingly minute threads, and the gray matter, of cells so small that the total number contained in the cortex has been ascertained to be approximately 9,200,000,000. The cortex, in each hemisphere, is traversed in every direction by millions of nerve-fibres, which connect the cells to each other, enabling them to act independently or in concert, as individuals or as groups. The cerebral cortex is the seat of the mind and the will. It is "the seat of those activities which we describe as intelligence—including states of consciousness, acts or idea-formation and volition, and the phenomenon of memory."[1] It also controls the voluntary action of the organs of the body. In the physical expression of a single thought, whether in word or action, probably many of these connected cells take part; and as the possible permutations of these millions of cells is practically infinite in number, the power of the brain to vary the shades of expression in thought or action is practically infinite.

The cerebellum is a comparatively small division of the brain, whose function is to coördinate and harmonize the complicated motor-apparatus and ensure the regularity of its action. It has no convolutions and no localized tracts or subdivisions, but acts as a whole. "Its removal or disorganization by disease is also generally unaccompanied by loss or disorder of sensibility; animals from which it is removed smell, see, hear, and feel pain to all appearances as perfectly as before. It cannot, therefore, be regarded as the principal organ of sensation" (Flourens: Magendie). But with its removal, a very profound disturbance in motor functions occurs, without loss of the power of perceiving sensa-

[1] Kirke's *Physiology*, sixth Am. Edition.

tions or of making voluntary efforts, but with loss of the ability properly to direct the action of the muscles. "It is not the source of voluntary movements, although it belongs to the motor apparatus, but it is the organ for the coördination of the voluntary movements, or for the excitement of the *combined* action of the muscles" (Kirke).

The great mass of white matter constituting the interior of the brain and a large element of the entire nervous system, is distinguished by its function of transmitting (as the thin cerebral covering of gray cortical matter is distinguished by the fact that it is that part of the brain in which originate) the impulses or vibrations that make up the sum total of brain activity. The interior mass of white matter in the cerebrum is traversed by millions or possibly billions of minute nerve-fibrils which, ramifying to every part of the cortex, connect it to the cerebellum and medulla oblongata, and from them extend to the spinal cord, and thence communicate to all parts of the physical system. The fibrils or paths of conduction from one hemisphere cross those from the other on their way to the spinal cord, with the result that an injury to either hemisphere is manifested by its effect on the opposite side of the body. These fibrils are telegraph lines or "wires," over which the cortex of the cerebrum transmits orders to and receives information from, substations (ganglions [1]) conveniently located for the purpose. As in all metallic-circuit telegraph lines, they are associated in pairs, of which one wire (the motor or efferent nerve) transmits orders from the brain,

[1] The ganglions, although so small as to approach the limit of visibility (and some of them to be actually invisible), are exceedingly elaborate and complex structures. Under the microscope, each ganglion is seen to consist of a membranous envelope or sheath containing an aggregation of nucleated cells and traversed by numerous nerve-fibres. The cells are in groups of varying size, and are separated from each other by the fibres, some of which traverse the ganglion

and the other wire (the sensory or afferent nerve) carries information to the brain; and are evidently insulated in some way, as their dispatches never go astray. But, although in pairs, they are so minute and arranged so close to each other, that to the eye the pair appear as a single thread. The "current" which passes over them, although swift, is exceedingly slow compared with the electric current in its passage over a

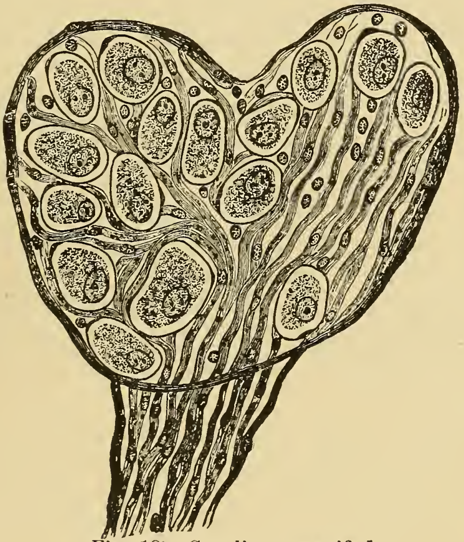

Fig. 18: Ganglion, magnified.

metallic wire; whence it has been conjectured that it is either non-electric or is retarded in some way in passing over the nerves. Twelve pairs of these nerves extend from the cortex

without being connected with the cells. The cut will give a general idea of the arrangement.

Apparently, the ganglion cells are reinforcing batteries for the telegraph lines, some acting directly on the line, and others by induction. It is possible that the ganglions are the effective means for producing the "reflex" or involuntary movements of the muscles.

of the cerebrum to different parts of the head and face, and establish direct connection with the eyes, ears, nose and tongue. Thirty-one pairs issue from different parts of the spinal cord and run to the ganglions arranged in rows at opposite sides of the vertebral column. From these ganglions, nerves, dividing and subdividing like the branches of a tree, bring every part of the skin and muscles, and even the arteries, veins and their capillaries, into effective communication with the ganglions, and, through them, with the spinal cord and the cerebral cortex.

Worthy of special mention (and of careful attention on the part of the reader) is the arrangement by which the

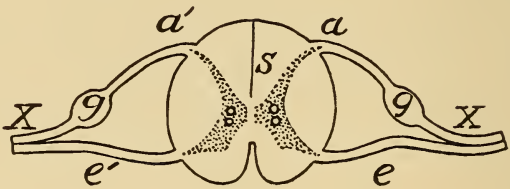

Fig. 19.

nerves pass out of the vertebral column to connect with the exterior ganglions. For some unknown reason, the Divine Architect considered it necessary or advisable that the afferent nerve-fibrils should be connected to the cord at its rear side, and the efferent fibrils at its front side. Accordingly, an arrangement was devised which is represented diagrammatically in the following cut, in which *a* and *e* indicate, respectively, the sensory and motor fibrils of a nerve extending from the spinal cord, *s*, to the left side of the body, and *a′*, *e′*, the corresponding fibrils of a nerve extending from the same part of the cord to the right side of the body. Once outside of the spine, these fibrils on each side come together again at x, x, and proceed to their destinations. It is evident that they are separated for a short distance only for the purpose of enabling them to make separate exits at each side of the spinal cord. But note how, after being separated from each other within the cord in order to pass out of the spine at different exits, they immediately turn toward each other outside of the spine and unite again in a single thread! Now this very peculiar arrangement might be regarded as accidental, or in other words as determined by chance, if it occurred only in a single instance; but there are thirty-one pairs of these fibrils, all similarly connected to the cord at different joints of the spine. Hence, the arrangement was clearly not determined by chance. On the other hand, no known law of evolution can account for it. There is, therefore, no conceivable explanation of the facts except that of intelligent Creative design. Indeed, the construction bears on its face unmistakable evidence of design—as does also the elaborately planned telegraph system of the human body of which the spinal connections here described form only one feature.

The question arises whether thought is originated by the brain itself, or by a spirit or soul acting upon and through the brain. This question transcends all others in importance to man, for upon the answer to it depends the solution of the enigma of human existence, nay, the solution of the enigma of the universe itself.

There are potent reasons which render it inconceivable that the brain can originate thought. The brain is a machine—as much so as a telegraph, or a telephone, or a typewriter. It is composed entirely of material elements. After death, it can be weighed, and analyzed, and every atom of it thus proved to be mere physical matter. Thought is not physical matter, nor a function or result of physical matter, unless the evidence of all human experience and knowledge is to be disregarded. We can no more conceive of thought as the function or result of the action of a machine than we can conceive of ourselves as the function or result of the boots which we wear. How can matter form a *conception of itself,* or invent the differential and integral calculus, or bring forth the fanciful but imaginary creations of a Shakespeare or a Milton! Matter cannot even create matter. To say, then, that it can create thought or form the splendid fancies of a Milton or a Dante is to say that the stream can rise infinitely higher than its fountain. We are compelled therefore, to believe that there is behind or within the brain something which creates the thought, and afterwards uses the brain, as a typewriter uses her machine, or an operator his telegraph, to give it physical expression.

A telegraph system does not create thought, but simply communicates it. Behind the telegraph there is always a *mind* dictating the thoughts of which the mechanical apparatus, like the pen, transmits the expression. When, therefore, we examine critically the combined telegraphic and telephonic system of the brain, we recognize, by its obvious analogy to the man-made telegraphs and telephones, the fact that it is a mechanical apparatus, and that, in the private office behind it, there sits a *mind* which has conceived the thought to which the apparatus is giving expression. The mental power that we term consciousness furnishes strong support to this conclusion. Consciousness is a word meaning that the mind, being intelligent, knows what it is doing. We are conscious of our thoughts, of our reasonings, of our conclusions, of the information that we receive through the brain, of the orders that we give through the brain to our physical organs, and of our mental states. There is no act of the *mind* of which consciousness does not take notice. But it takes notice of nothing else,—not even of the movements of our own physical organs, except so far as they may have been telegraphically reported back to the mind through the brain telegraph system. For example, if I wish to raise my right foot, I order (that is, *will*) the movement to take place; through the transmitting-cell of the brain a current is sent to the appropriate muscles of the right leg, and they lift the foot from the ground. There is consciousness of the action of the will in directing the foot to be raised, but no consciousness of the telegraph-wire (the efferent or outgoing nerve) nor of the current passing over it. If, however, the nerve be severed, no current passes and the foot is not lifted: in other words, the line is out of working order, and the message does not reach the receiving-station. In reverse order, if, when my foot is on the ground, somebody grasps it and raises it from the ground, several telegraph-stations in the vicinity of the area of disturbance instantly telegraph the facts through another and different wire (the afferent or incoming nerve) to the brain, which immediately delivers the messages to my mind. But if the incoming wire has been severed, my mind does not get the information, and I have no knowledge that my foot has been raised, unless the eye has seen it rising, and has wired the news through the optic nerve and the brain to the conscious mind.

In all this, the correspondence of the brain-telegraph to the telegraph which man instals for business purposes is complete except in one respect, namely, that, in man's commercial telegraphs, a dictating mind must be stationed at each end of the line, whereas, in the brain-telegraph, the dictating mind is stationed at one end of the line, and the other end transmits automatically, somewhat in the manner of a telephone. The Infinite constructor has contrived the brain-telegraph in that way in order that every event which produces any impression, however slight, on the surface of the living body may automatically and instantly give notice to the brain of what has been done.

Now, the particular fact which I desire to impress clearly and strongly upon the mind of the reader is, that in causing his brain-telegraph to be set into operation, his consciousness gives him exactly the same information that it gives to him when he causes his ordinary commercial telegraph to be set into operation—no more, no less. And this fact every person can readily verify for himself. In each case he is conscious of mentally framing the dispatch, of ordering (willing) it to be sent, and of nothing more. He is not conscious that the transmitting instrument is operated, nor that a current passes over the line, nor of what takes place at the receiving station. If he will wait long enough, the return-wire (nerve) will bring him back a dispatch from the other end of the line informing him that his orders have been received and acted upon. On the commercial line, also, he may get an answer by wire giving him similar information.

The parallelism is complete, simply because the two transactions are precisely the same. We are dealing with *like facts,* and not with allegories or fancies.

Both reason and our own consciousness thus assure us that the brain-machine and the mind which controls and uses it are two entirely different things. The former, like any other machine, is composed of matter which can be seen, touched, weighed—which, when organized into a machine, will operate for a while until worn out. A machine, when worn out, is sent to the scrap-yard. If composed of any metallic parts, they may be remelted, and used for other purposes. If not composed of any metallic parts, the elements attack it and slowly reduce it to a fertilizer. The particular machine of flesh and blood which we call man's body has no metallic parts, and it ultimately shares the destiny of all other machines. But the mind which operates it till it is worn out, is invisible, intangible, imponderable. It is not a part of the machine, but is the personality who operates it—evidently a separate entity, like the operator of any other machine. When a machine is worn out, its remains may be weighed and analyzed by chemical processes, and every atom of it thus accounted for; but that does not account for the person who operated and used it.

Science looks to the laws of Evolution to explain, if they can, the origin of the machine, and has formulated, in Darwin's theory, all that is known of those laws. We examine them, and find that they cannot account for the origin, or explain the construction, of any one of the billions of cells of which the mechanism is composed. Science long ago gave up all hope of ever being able to explain the nature, origin, or genesis, of the mind. That subject remains an inscrutable mystery.

But there are many things known about the machine—the telegraph system—through which the mind acts to give expression to its thoughts. Some of these things have been already set forth; others remain to be considered, to ascertain what further light they will give, if any, upon the relation of the machine to the mind which operates it.

Everybody knows that it is not necessary to give any thought to the operation of certain most important parts of our physical system. Nature kindly provided that the nutritive and circulating apparatus, whose constant action is necessary to the maintenance of life, shall be kept in operation by the body automatically. Otherwise, the care which they would require would prevent us from attending to anything else, and the Creator would be obliged to resort to some other scheme of animal existence, in which infancy and sleep should have no place. Nature has, therefore, relieved the brain from the necessity of attending to the working of the automatic apparatus; and, as usual with her, the means for accomplishing this result are very simple and effective, consisting of nothing more than the omission, from the automatic organs, of the *motor* nerves necessary to enable the brain to control them at will. Meanwhile, she has not neglected to provide them with a full equipment of *sensory* nerves, by which they can inform the brain when anything worthy of its attention occurs to them. For example, there is no motor nerve by which we can control at will the action of the heart or the process of digestion; but when neuralgia or inflammation attacks the heart, the stomach, or the bowels, their sensory nerves, always on guard, warn us that those organs are suffering and that the doctor should be summoned without delay. The absence of all motor-connections from the brain to the vital organs (the heart, lungs, stomach, bowels, liver and kidneys), when considered in connection with the careful retention of the sensory nerve-connections between the same organs and the brain, certainly looks very much as if it were the work of design.

Unlike the vital organs, which have no motor nerves connected with the brain and are therefore not under its control, the non-vital organs (the limbs and their members, the lower jaw, the tongue, the eyes, the face, the vocal organs, the organs of deglutition, the sphincters, and the complicated combination of ribs, diaphragm and muscles that operates the breathing-apparatus, are provided with motor-nerves leading to the brain, and are therefore under its immediate control. Several of these non-vital organs are arranged in pairs; and here comes another evidence of design—for the paired eyes, which must necessarily move always in absolute harmony in order to ensure accuracy of vision, are controlled by separate muscles which are cross-connected by nerves, thus compelling both eyes to move with perfect simultaneity and harmony; whereas, on the contrary, the paired eyelids, arms, legs, hands, feet, fingers, and toes, which are required to move sometimes independently of each other, are not so cross-connected and are thus free to be moved at will either separately or together. It is easy to see how an intelligent Creator should understand the necessity of crossing the nerves of the eye-muscles and thus perfecting His work; but I confess that it is impossible for me to see how this ingenious and altogether admirable invention—the crossed nerves—could have created itself, or could have been created by any conceivable process of evolution. I never knew the need of an invention to create the invention; although I have many times known it to suggest to the intelligence of man the desirability of trying to invent something to meet the want. But Evolution has no intelligence, and never invented anything. She could never have conceived that for normal vision the eyes must move in perfect harmony, nor that, by connecting the six muscles of each eye by cross-nerves with the corresponding six muscles of the other eye, that result would be attained and the perfect harmony of the eyes ensured.

Did you ever consider how perfect that harmony is, and how complicated the arrangements of the mechanism necessary to secure it? If not, it is well worth while to give it a little study. First, observe that, without moving the body or head, you can with the eyes sweep the entire field of vision, in a horizontal plane, in a vertical plane above and below the horizontal, and in any one of the infinite number of inclined planes; and you can make any one of these movements almost instantly, and so easily that you have only to will it and it is done as if by magic. While the eyes are thus sweeping the field of vision, they adjust themselves automatically to the variations of focal distance. And, all the while, they move in exact simultaneity, and without the slightest disturbance of vision. The order to make the movement is issued through the brain, and communicated by the motor-nerves connecting it with the eye-muscles. Next, consider what is necessary to secure the wonderful harmony of movement. Twelve muscles are required—six to each eye—to roll the eyes in their sockets. The motor-nerves from the brain will energize the muscles at your will; but that alone will not suffice. Motor-nerves from the brain will energize the muscles of the feet at your volition, but you will find that it requires long practice to be able to jump both feet at once to precisely the same distance. Such an arrangement, therefore, would not do for the eyes—they must be connected by some means which will ensure the exact coincidence of their movements. As the muscles of the eye are too far back in the socket to be seen from any point in front of the eye, their arrangement and that of their nerves cannot be clearly illustrated in a cut; but the following diagram will enable the arrangement of their crossed nerves to be understood.

It will at once be evident that this diagram indicates a complex and carefully-planned mechanical invention. For turning the eyeball towards the right or left, the means adopted are similar to the braces or sheets by which the main yard of a ship is turned to the right and left. If, now, her main yard were so connected to her fore yard that both would always swing exactly coincidently, the movement of the two yards would illustrate the movement of the two eyes to the right or left. But for turning the eyes upward and downward, the arrangement must be duplicated in a vertical plane; and again duplicated for turning them obliquely. Neither the two yards nor the two eyes could be directly connected so as to establish these movements without cramping, and so, in the case of the two eyes, a different construction had to be resorted to—and the desired result was attained by providing muscles to directly move the eyes, and by using electric circuits, or their equivalents, to energize the muscles, and cross-connecting the circuits. Now if that is not invention then pray what *is* invention!

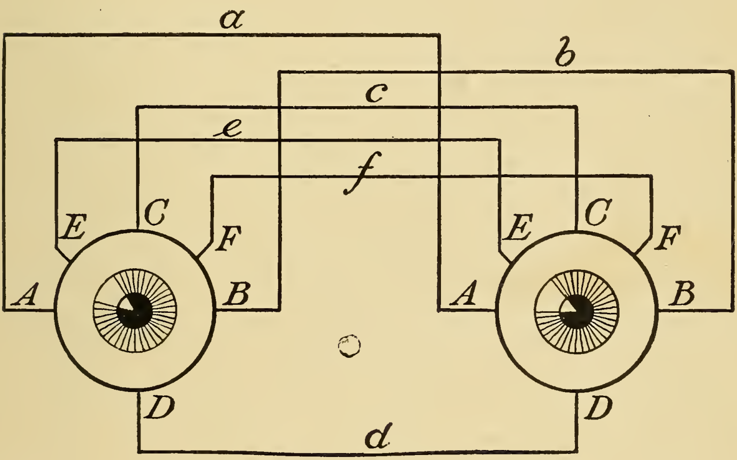

Fig. 20. Diagram.

Comparatively recent anatomical discoveries have demonstrated a number of important facts concerning the relation of the brain-structure to the mind and to the voluntary activities of the body: 1.—One of these facts is, that particular tracts of the cerebral cortex (in both hemispheres), through which muscular control is exercised by the will, have been identified and located; so it is now possible to make a map showing the location of many of these tracts and approximately defining their boundaries.

As these motor-regions are in duplicates (one for each

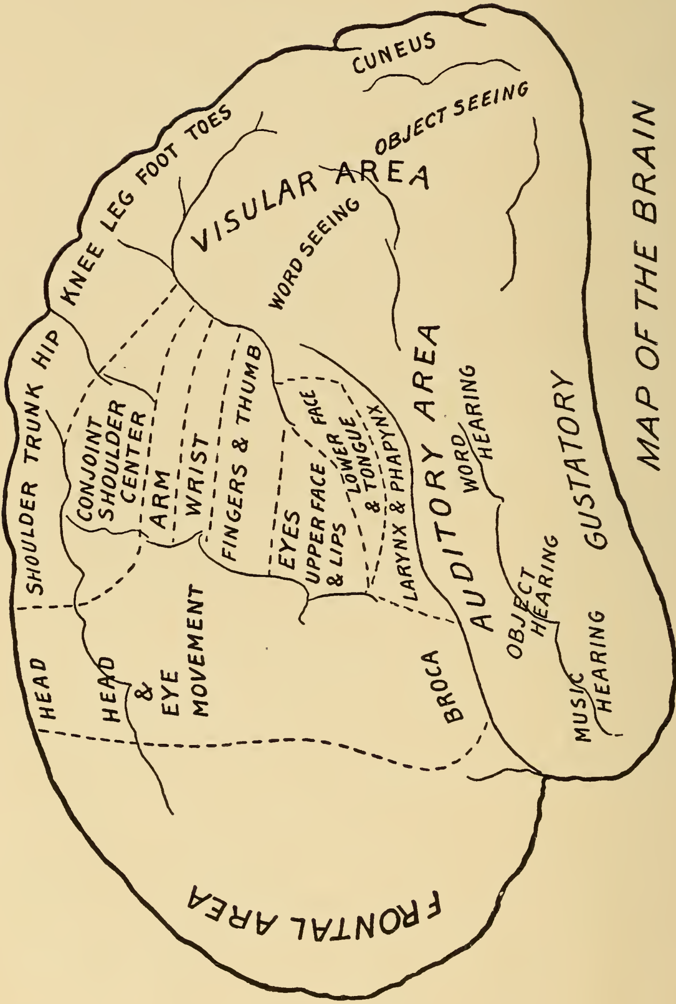
CUNEUS
OBJECT SEEING
VISULAR AREA
WORD SEEING
KNEE LEG FOOT TOES
HIP
SHOULDER TRUNK
CONJOINT SHOULDER CENTER
ARM
WRIST
FINGERS & THUMB
EYES
UPPER FACE & LIPS
FACE
LOWER & TONGUE
LARYNX & PHAPYNX
AUDITORY AREA
WORD HEARING
OBJECT HEARING
MUSIC HEARING
GUSTATORY
HEAD
HEAD & EYE MOVEMENT
BROCA
FRONTAL AREA
MAP OF THE BRAIN

Fig. 21.

hemisphere) and both are normally active; and, as in traversing the brain-stem the nerves of each hemisphere cross to the opposite side, it results that if the right hemisphere be seriously injured in its motor region the limbs on the left side will be paralyzed, and if the left hemisphere be injured the limbs on the right side will be paralyzed. If the injury is confined to a single tract of the motor-region, the paralysis is confined to the limb or member controlled by that tract. So that now, when a surgeon is called to a case of right or left paralysis, he has only to ascertain what limbs or members are affected, in order to determine the locality where the injury was suffered in the opposite hemisphere.

2.—The second fact recently discovered is, that the purely-intellectual or mental faculties occupy other definite tracts of the brain-cortex, *but in only one of the two hemispheres;* and that thus we do all our thinking in only one half of the brain. This is at once illustrated and proved by a very remarkable medical case reported in the *American Journal of Medical Sciences* for March, 1899. In that case, the patient, a carpenter, found on awaking one morning that his left side was numb and paralyzed. He remained in that condition ten years until he died at the age of fifty-seven. During a considerable part of those ten years, he was under the care of a noted physician, Dr. Pearce Bailey, who reported the case in the American Journal. Dr. Bailey reports that during all the ten years the patient remained paralyzed, but his speech was perfectly normal, his reading good, his memory unaffected. He gave no sign of mental weakness, but was always intelligent, patient, cheerful and particularly good in attention. He read the newspapers constantly, and liked to talk politics. He bore his inability bravely, and was neither depressed, emotional, irritable nor apathetic. At the post mortem examination it was found that the left hemisphere was normal in size and in the configuration of its convolutions; while the whole tissue of the right hemisphere was disorganized and without any remains of gray matter. The posterior half of this hemisphere was everywhere atrophied, and greatly reduced in size; so that the brain, as represented in the cut printed with Dr. Pearce's report, resembled in shape a shelled walnut which on one side of the median line had not half-developed. The frontal part of this hemisphere, comprising nearly the whole of it, was occupied by a large fibrous tumor or cyst, of a dirty white color, more resistant to the knife than is the brain, and showing no gray matter. Under the microscope, the contents of this region appeared as a shapeless mass, destitute of ganglions or cells; while the structure of the left hemisphere was normal. The left side of the spinal cord was greatly atrophied and reduced in volume. Thus: the right hemisphere had been practically destroyed, without affecting the mind.

The relative arrangement of the cortex-tracts in the hemisphere through which our intellectual activities are manifested, is shown in the following two cuts.

The intellectual faculties require no motor-nerves, for they have nothing to do with the muscular activities. And they have use only for such sensory nerves as will bring them information. The mind is accordingly furnished with local intelligence-offices, or libraries for the receipt and storage of all such information. One of these libraries is devoted to the memory of words seen; another to the memory of objects seen; one to the memory of words heard, and another to the memory of objects heard; one to the memory of music, one to the memory of impressions made by tasting; and one to the memory of impressions made by touch. These offices or libraries have been definitely located, as shown by the map. (Fig. 21.) Judging from what has been accomplished by the investigations that have been going on all over the world since April, 1861, when Dr. Paul Broca first called attention to the subject by reporting to the Anthropological Society of

Fig. 22.

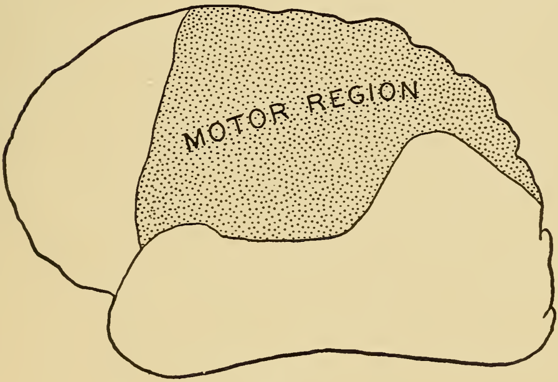

Fig. 23.

Paris his famous discovery of the seat of the speaking-faculty in the third frontal convolution (since called Broca's convolution), we are justified in expecting that before many years shall have passed away the locations of other mental-libraries will be discovered and mapped—perhaps the places where are stored the memories of our own thoughts, feelings or conclusions, or the memories of distance, height, weight, color.

All this information as to the division of the brain-cortex into "seats" (for muscular control), and into mental "libraries," has been acquired, not by conjecture or arbitrary assumption, as the phrenologists undertook to do, but by careful scientific investigation and research. A few examples will be illustrative. Dr. Broca first discovered the motor seat of speaking by making post-mortem examinations of persons who had suffered the loss of that power by apoplexy or other injury to the brain. He found invariably that the injury had been to the third frontal convolution: and subsequent observation has fully confirmed the fact. The case reported by Dr. Pearce Bailey has been already described hereinabove. In a case reported in the *British Medical Journal* for 1888, the patient's skull had been broken, driving a fragment of the inner table in against the spot where is located the "library" for storing the memories of things seen, thus depriving him of the power to recognize persons or objects by sight alone. He could see perfectly, but could not recognize his wife and children. He could not recognize his own fingers, nor count them except by the aid of the sense of touch. A fellow-workman remained unknown until he spoke, when the voice was recognized. A surgical operation relieved the cortex from the pressure, and the patient afterwards fully recovered and went back to work. Many other similar cases have been reported. In still other cases, where the cortex has been injured in that locality where are stored the memories of sounds, the ear has continued to hear as well as ever, but the mind could no longer distinguish one sound from another—all sounds had become mere noises. Undoubtedly, that quite common infirmity which is called color-blindness is due to a similar cause—for the person affected can see as well as other people, but cannot distinguish between two or more different colors; probably that spot in the cortex where color-memories are stored had been imperfectly developed in his case.

3.—Another remarkable fact is, that a brain-library, like any other library, may suffer the loss or misplacement of one or more of its records, while the rest of its contents remain in place, undisturbed. Thus, in some cases, persons have suddenly lost the ability to read written or printed letters, while retaining the power to read and understand written or printed figures—place before them, for example, a sheet of paper on which were the words "fifteen hundred thousand," they would have no conception of what those marks meant; but give them a sheet containing the expression 1,500,000, there would be no difficulty in reading and understanding the figures. In one case, an educated English gentleman, familiar with the English, French, Latin and Greek languages, suddenly found himself unable to read. Shortly afterwards, he discovered that what he had lost was not the power to read, but the power to read English words. Greek, he could read as well as ever; Latin and French, with more or less difficulty; and music perfectly. In another case, a Frenchman, who had been employed in Scotland as a teacher of the French language, and had returned to his native country, lost, by an apoplexy, the power to understand French by hearing it spoken, and thenceforth had to be addressed in English. What these cases mean is, that the cortex-libraries in which had been stored, in the respective instances, the memory of words as distinguished from figures, of English, Latin and French words as distinguished from Greek words, or of French as distinguished from English, had lost a part of their contents. It also indicates unmistakably that in these brain-libraries, as in all other properly-managed libraries, the contents are arranged with reference to subject-matter—words being arranged in one alcove and figures in another; and English, French, Latin and Greek arranged on separate shelves. To what extremes of minuteness this process of subdivision has been carried is not yet known; but science is gradually learning more and more about it.

4.—Another recently-discovered fact, of most serious importance, is the fact that as above stated, the brain "libraries" are located *in only one hemisphere;* not, indeed, invariably in the right, or invariably in the left, hemisphere; but always in one alone: further, that both hemispheres are, prior to birth, fitted up alike for the accommodation of these libraries; and, finally, that if the quarters first used for them be injured during youth, they can be moved into the hitherto unused quarters in the other hemisphere, although this cannot be accomplished after middle life.[1]

These are, indeed, strange discoveries! They seem to make it entirely clear that the Intelligence which uses the libraries is not a product of the brain, but merely, so to speak, the tenant of certain apartments in one hemisphere, with the privilege, for a reasonable time, of migrating into precisely-similar apartments in the other hemisphere in case its original quarters prove to be untenantable. They demonstrate that the mind is not due to the action of the brain

[1] It has been conjectured that, from want of use, the seat in the unoccupied hemisphere becomes atrophied in the course of time, just as a muscle does from non-use. But, at all events, for several years after birth, the mental faculties can migrate from one hemisphere to the other, if the one used becomes injured so as to be no longer fit to perform its functions.

as a whole, or of either of its hemispheres, or of its cells—not due to the action of the brain as a whole, for, in the carpenter's case, one half of the brain was destroyed without impairing the mind; not due to any power or capacity peculiar to one hemisphere alone, for, in many cases, after conducting its operations for several years in one of the hemispheres, and that hemisphere having become injured, the mind has migrated to the other hemisphere and gone on with its work; not due to the organized action of the cells, for, in the carpenter's case, one-half of the cells were destroyed without affecting the mind; not due to any one cell alone, for no cell can change from one hemisphere to the other. Look at the facts as we will, we are forced to the conclusion that the mind is not the product, function, or result, of any material thing or things. It is itself immaterial—we cannot conceive how it could be produced from matter; and an examination of the brain proves that it was not so produced. There is no other alternative but that the mind is an independent immaterial or spiritual entity or personality, which uses the brain as a mere instrument or machine by means of which to accomplish its purposes. And we cannot but agree that the mechanical instrument used by it is the most marvellous embodiment of Creative ingenuity and skill that is known to man.

Undoubtedly, the cells of which the cortex is composed are not all constructed alike internally; but the size of their molecules is so minute, and the size of their component atoms so nearly infinitesimal, that the microscope can give us no information as to their internal construction. As we have already seen,[1] spectrum analysis, with its colored bands of light, shows that the atoms of matter are most complex structures; but that is substantially all that it can reveal that

[1] See *ante*, p. 135.

would be of the slightest use in this discussion. Similarities or dissimilarities in the internal structure of the cortex-cells may, however, be safely inferred from the similarity or dissimilarity of their functions or results. Judging in that way, we may reasonably infer that the motor-cells of the cortex are in all essential respects constructed alike; for the swelling or contraction of muscle is their only function. But the cells of the intellectual area cannot be alike in construction; for no such area can exchange functions with any other area. The cells in which are stored the memories of words heard, for example, cannot be used for storing the memories of words read. Order is Heaven's "first law;" and nowhere is it more invariable than in the construction of the brain. It is easy to conceive of a physical basis for this difference between cells adapted to receive impressions from things heard and other cells adapted to receive impressions from things seen; for the sound-waves and the light-waves, from which these impressions respectively originate, are very different in their mechanical action.

In a work such as this, the subject of the brain and its relation to the mind can only be treated in outline, leaving the reader to fill in the details by reference to medical and scientific authorities. Enough has been said, however, to render it clear that the brain furnishes strong evidence of Creative design, and at the same time proves that mind is not created by matter, but is an immaterial something that thinks for itself and uses the brain and other physical organs as its instruments.

CHAPTER XX.

God.

The three most impressive facts in the material universe are, the reign of universal law, the existence of universal order, and the indications everywhere in nature of the exercise of contrivance and design. These facts, evident even to the dullest apprehension, are manifestly not due to chance or accidental coincidence, but to some broad and far-reaching cause which acts under the direction of intelligence. All three of them indicate clearly the action of mind, and are not explainable on any other theory. Contrivance and design prove not only the action of mind, but of personality and will. When manifested clearly and unmistakably in the works of nature, as they are in a thousand different ways, there is only one theory that can account for them—the theory of a Supreme Being who created and governs the universe.

The atheist finds himself obliged to admit the existence of law and order throughout the material universe; but he ascribes the uniformity and regularity of nature's processes to some mysterious force which he assumes to be inherent in matter itself, thus overlooking the unanswerable evidence of intelligent Creative contrivance and design. But until that evidence shall be rebutted or explained away (which cannot be done), it will be useless for men to waste time in discussing the imaginary mysterious "force of nature." There is no evidence that any such "force" exists; whereas, the evidence of Creative contrivance and design is conclusive, and supersedes all necessity for imagining any further or other explanation of the known facts.

Aside from the atheist's visionary conjecture of a mysterious life-force inherent in matter itself, there is nothing to be considered that has not already been disposed of by the facts and arguments hereinbefore set forth. We do, indeed, occasionally hear evolution mentioned as the explanation of all things in nature; but only by persons who are accustomed to use words without any clearly-defined idea of their meaning. When they speak of evolution as accounting for everything in nature, it is clear that they do not mean the evolution referred to by Darwin, for his theory did not undertake to explain anything but the progressive development of plants and animals from their living germs. There is no theory of evolution except that of Darwin.

We have come, then, to the end of our discussion, so far as it concerns the great question whether God exists and governs the universe. The proof of His existence and government is so clear and convincing that it must be pronounced absolutely conclusive. There is no room for any other verdict; for in all nature there is found not the slightest evidence to the contrary.

This conclusion accepted, as it must be by all reasoning minds, Evolution disappears as a religious question. It will always remain interesting, and scientifically valuable as a theory on which to explain the processes of animal and plant development from the living germ. For it is undoubtedly based upon fundamental truth—the truth that God is not clothed in a material body, and therefore works His will by establishing general laws for the control and government of material things. To ascertain and formulate those laws is the high prerogative of science. As an aid in that work, Darwin, after a lifetime devoted to the study of nature, put forth his celebrated Theory. It does not fully and satisfactorily explain all the phenomena of animal and plant development, but does satisfactorily explain many of them. Evidently, God has implanted in the very nature of matter and force some deeper and more far-reaching law than any yet discovered.

Science has not only enabled us to prove the existence and government of God, but it has done much more than that—it has furnished us with information that practically amounts to a new revelation of God Himself. That revelation tells us of His eternity; for He existed before time began: of His omnipotence; for He controls the universe: of His omnipresence; for He is acting at the same time everywhere throughout the universe: of His omniscience; for that follows from His omnipresence: and of His incorporeal unity; for it is clear that the works of nature were all produced by one and the same Maker, who is not embodied in material form, but who

> ''Lives through all life, extends through all extent,
> Spreads undivided, operates unspent.''

The church tells us that God is immanent—that is, that He dwells personally in everything. Science goes far to confirm this dogma, by taking us down to the very basement story of the material universe, the most secret laboratory of nature, and revealing dimly to our astonished eyes the wonderful work going on inside of the atoms themselves. With the aid of the spectroscope and the cathode ray, we can make out that each atom is filled with a most elaborate mechanism, of inconceivable perfection—scores or hundreds of wheels revolving with almost the speed of light, and all working with the utmost harmony. The details of construction we cannot see; but we observe that the energy of the internal action sets the whole atom into violent oscillations, which appear to coöperate with those of the neighboring atoms for the production of some unknown result. The world was not aware of the existence of this strange mechanism till within a few years past; for science had not yet been able to observe the operation of a machine that is contained within a space of less than a billionth of an inch—a space so small that if magnified a thousand times it would still be invisible through microscopes of the greatest power.

Thus, "the immanence of God," which, in the creed, is a cold and lifeless form of words, incomprehensible even to the imagination, becomes an intensely vital and present reality when we discover His handiwork in the internal construction of the infinitesimal atom, and realize that it, too, exhibits mechanism and contrivance. "Mechanism, mechanism, mechanism," is the universal revelation of science—mechanism in the largest and in the least of nature's works—in those that are living, and in those that are as lifeless as the rocks.

The eternal immanence of God is, therefore, an inevitable conclusion of science, and not a mere theological dogma. At this point, science and theology come together in harmony: for science proves contrivance or design in the works of nature; design in the works of nature proves the existence and government of God; the universality of design throughout the universe—even in the structure of its ultimate atoms—proves the Divine immanence; and the Divine immanence explains Evolution and, through it, perfectly reconciles religion and science.

It is sometimes objected that man's conception of God as having Personality is anthropomorphite and therefore fallacious; that such a God is a mere phantom of man's imagination; that the God whose mysterious action is manifested in nature is unconditioned by any characteristic which man's mind can conceive, and hence must be absolutely unknowable. This objection, while not denying the existence of God, practically would banish Him from human affairs and even from human thought. But this objection is not supported by science. The Creator revealed by Himself in nature is incorporeal—therefore in the physical sense unlike man; but He possesses the same intellectual attributes as man, only in an infinitely greater degree. It would be presumptuous even to discuss His attributes, had He not authorized us to do so by revealing Himself in His own works—the only kind of revelation of Him that we could rely upon without possibility of error. As thus revealed, He is a Being who thinks; reasons; plans; chooses one alternative because it is the best for one situation, and the other because it is the best for the other situation; avoids insuperable difficulties by getting around them; wills; executes; contrives; knows all things; remembers all things; appreciates the beautiful, the grand, the harmony of color, the symmetry of proportions; exhibits care and affection for his creatures. Do you not recognize these all as human characteristics, differing from the superhuman only in degree? They are not the illusions of fancy, but are facts incidentally proved by the examples cited in the foregoing pages as illustrative of Creative design and now found to go much further than that and to make known the personal attributes of the Deity himself. Only in two respects do they fall short, namely, in that they do not reveal His moral nature, nor His Prescience. It is impossible that they should reveal His moral nature; for that can be revealed only in two ways, to wit: firstly, by the creation of moral agencies and the government of them by moral laws, and, secondly, by direct revelation of His moral purposes—

neither of which subjects has come within the purview of our discussion, up to this point. Nor have we had occasion to touch upon the subject of Prescience.

But when we come to consider Man and the question of his immortality, it is possible that the revelation of God may be completed. One thing, at least is certain, to wit, that, in an intellectual sense, Man was made in the image of God. God is, therefore, not unknowable to Man, although He may be to all His other creatures, and certainly *is* to all others of whom we have any knowledge.

PART II

CHAPTER XXI.

Man—General Reflections. The Teaching of Science Is, That, God Being Eternal, Man Must Be Immortal.

We have seen not only that the works of nature prove the existence and government of God, but also that they clearly reveal many of His attributes, and, especially that they reveal, apparently, a Divine purpose in the construction of the material universe—a purpose which is of supreme interest to man, because it indicates that his welfare is, for some unknown reason, a paramount object of the Creator's solicitude. He has placed man at the head of His creatures, made him the master and them the servants, and given him the power to maintain his position. All others, He has locked up in physical conditions that forever preclude the possibility of rising above their present level. To man, He has opened the door for endless progress, and has bestowed upon him intellectual powers that are apparently unlimited.

What does all this avail man if he is to become extinct at the end of a few years? Why has God created and fitted up a world for his exclusive control, and made him the most gifted of all his creatures, if there be nothing beyond this life? The brutes know all that it is necessary for them to know for the purpose of their existence; and, if there is no hereafter, they are far happier than he, for they have no care nor anxiety about the future, no ambition to threaten disappointment, no greed for wealth to render their nights sleepless and their days miserable, no God, no conscience, no remorse. Nature even provides their clothing, which never wears out. Verily, if this life be all there is for man, then the plan of nature is infinitely unreasonable, unjust and wrong. The few years alloted to him in this life are too short for the full development of his higher faculties. See how slow has been the progress of the race in knowledge, wisdom and morals! After more than eighteen hundred years of instruction in the principles of the Golden Rule, common honesty and sexual purity, the leaders of the Church were still debating with bitterness and asperity the question whether or not the moral law approves of human slavery, "the sum of all villainies!" And I doubt not that, for ten thousand years yet to come, the rule in practise between the laborer and his employer, the tradesman and his customer, the agent and his principal, will continue to be something very different from the Golden Rule.

If, then, man, the individual, is to get the full benefit of his unlimited capacity for intellectual and moral development it must be in a future life, and not in this. So, too, if virtue is to receive its reward and vice its punishment, it must be there, not here. When limited to this life, virtue is *not* always rewarded, vice is seldom punished, and absolute justice is an idle dream.

Thus the scheme of the universe itself indicates the necessity for man's future life. The whole plan would be awry without it. Things would be out of all proportion to each other. If this life be all there is of man, a universe would have been created for nothing—the mountain would have been in labor only to bring forth "a ridiculous mouse."

All this is certainly irreconcilable with nature's revelation of her own methods. She does not exhibit herself to us as wasting her energies, nor as employing means that are in disproportion to the ends to be accomplished by them. So universally is this recognized as true that the common speech bears witness of it in many a familiar expression, such as, for example, that "nature does nothing in vain." Darwin's theory of development by progressive gradual modification has endeavored to account for it as far as it relates to animal and plant life; but the observed facts go far beyond the narrow limits of his theory, taking in cosmical processes as well as the phenomena of life. Yet, if it be true that nature does nothing in vain, it cannot at the same time be true that she has created and fitted up a magnificent and beautiful world for the benefit of brutes whose faculties are incapable even of seeing its beauties, nor that she has equipped man with his godlike capacity for unlimited mental and moral advancement, and cut him off with a few years of existence in which he has practically no opportunity to exercise his powers. Placed in a world where disappointment is the rule and success the exception, and given insufficient time in which to learn how to avoid the making of grave mistakes, few old men come to the end of life without feeling that it has been unsatisfactory, and that they ought to have the opportunity to come back and try it over again, or at least they ought to be accorded another term of existence, in another world, where they may be able to profit by their hard-earned experience in this life. Such thoughts cannot be called unreasonable; for they are based upon that intuitive sentiment of justice which is the common heritage of all human beings.

At this point, science comes to our relief, assuring us not only that there is nothing improbable in the hoped-for state of existence beyond the grave, but that there are most cogent reasons for believing the hope well-founded. She calls our attention to the fact that, at what we call death, the material body ceases to be used, and disintegrates into its original elements, *but that the mind is still to be accounted for.* She makes known to us, through the structure and operation of the brain itself, that the mind is not the product of the brain or of any other form of matter, but there is something immaterial in its nature and yet as certainly real and existent as is the body. And, lastly, she bids us remember always that God is immaterial and eternally existent; and that He manifests (only in a higher degree) every super-physical power that distinguishes mind from matter—manifests it by the very acts by which our minds manifest it, namely, by thinking, knowing, willing, contriving, adapting means to ends, reasoning, remembering, and creating—acts of which matter is absolutely incapable.

The two facts thus verified by scientific research, viz., that our minds have nothing material either in their origin or their essence, and, secondly, that the eternal Being who created nature and her works manifests powers and faculties strikingly analogous to those manifested by our own minds, give us strong assurance that the substance of spirit, mind, or soul, whether existing in God or man, is intrinsically and necessarily immortal. Knowing the eternity of God, it is impossible, in view of these facts, to believe the existence of man less than eternal. When, therefore, the Church argues that the interests of the soul are of infinitely more importance than the interests of the body, it speaks in strict accordance with the teachings of science.

The materialist, blind to everything whose origin he cannot trace beyond the dirt, sees the body come from dust, and therefore rashly concludes that the mind comes from no higher source. But, if we may be allowed to use the expression in all reverence, matter did not produce the stuff that God is made of, nor did it produce the similar stuff that the soul of man is made of. That soul is a spark from the celestial fire which never goes out; that spark will never be extinguished. Thus we find ourselves driven to the same conclusion reached by Darwin, that, however science may account for the body, it must admit that "life, with its several powers," was originally "breathed into" it by the Creator.

This conclusion throws a new light upon the universe, making clear a thousand things that would otherwise remain unfathomable mysteries: revealing a conceivable motive for Creation, commensurable with the vastness of its design; explaining why this beautiful world was fitted up with so much care and foresight for man's sole benefit; and impressing upon us the feeling that this life, short and unsatisfactory as it is, and restrained by irksome physical conditions, is, somehow, disciplinary, and preparatory for a future state of existence, in which physical impediments shall no longer hamper us, and the soul shall be free to go forth upon its immeasurable career onward and upward.

If this is the meaning of life, the question whether life is worth living need trouble us no longer. Its burdens and disappointments, and the inequalities of conditions here below, may well be patiently endured, if we only make good use of its opportunities for self-discipline—opportunities which, if rightly used, will enable us to begin our new existence on a higher plane, but if lost can never be recovered.

CHAPTER XXII.

Same Subject Continued. Certain Faculties of the Mind not Adapted to This Life, But Only to the Future Life. Music and Speech Are Adapted to Both Worlds.

If the mind should be found to possess powers or faculties that are unnecessary for the purposes of man's existence here on Earth, but conceivably useful, or even necessary, for his existence in the spirit world, the discovery of such powers or faculties in it here would furnish strong corroborative evidence of its survival after the death of the body. It would prove beyond a reasonable doubt that the body is only a temporary structure adapted for the purposes of this life, and not at all adapted to give full play to the powers of the real personality within it.

Now, it appears to be a well-established scientific fact that the mind has such extraordinary powers or faculties, and that telepathy is one of them. Sir Oliver Lodge, who investigated the phenomena of telepathy carefully, and whose position in the front rank of English scientists entitles his statements to great weight, says:

"What we can assert is this, that the facts of 'telepathy,' and in a less degree of what is called 'clairvoyance,' must be regarded as practically established, in the minds of those who have studied them. There may be, indeed there is, still much doubt about the explanation to be attached to those facts; there is uncertainty as to their real meaning, and as to whether the idea half-suggested by the word 'telepathy,' is completely correct; but the facts themselves are too numerous and well-authenticated to be doubted,—even if we except from our survey the directly experimental cases designed to test and bring to book this strange human faculty." [1]

What we mean by the word "telepathy" is: the ability of our mind to communicate directly with another mind, without the intervention of physical organs or other material means of conveying information or impressions. There are very few intelligent persons of adult age who have not, at one time or another, witnessed proofs of the existence of "this strange human faculty." The information transmitted and received by it varies greatly in clearness and definiteness, sometimes being as precise, positive and unmistakable as if it were expressed in words, at other times a mere vague feeling or impression. Its transmission does not appear to depend either upon the volition of the person sending or the one receiving the intelligence, but one mind simply seems to know, at any distance, how another mind is affected at that particular moment by anything of interest to both. It is often manifested in dreams—for example, as related by Lord Roberts in Chapter III of his "Forty-one Years in India." Lord Roberts was serving under his father, Gen. Abraham Roberts, at Peshawar, in India. His father, nearly seventy years of age, was unwell and, under the advice of his physicians, was about to return to England for his health. Lord Roberts relates the incident as follows:

"Shortly before his departure, an incident occurred which I will relate for the benefit of psychological students: they may, perhaps, be able to explain it. I never could. My father had some time before issued invitations for a dance, which was to take place in two days' time, on Monday the 17th of October, 1853. On the Saturday morning he ap-

[1] *Science and Immortality*, p. 73.

peared disturbed and unhappy, and during breakfast he was silent and despondent—very different from his usual bright and cheery self. On my questioning him as to the cause, he told me he had had an unpleasant dream—one which he had dreamt several times before and which had always been followed by the death of a near relation. As the day advanced, in spite of my efforts to cheer him, he became more and more depressed, and even said he should like to put off the dance. I dissuaded him from taking this step for the time being; but that night he had the same dream again and the next morning he insisted on the dance being postponed. It seemed to me rather absurd to have to disappoint our friends because of a dream. There was, however, nothing for it but to carry out my father's wishes, and intimation was accordingly sent to the invited guests. The following morning the post brought news of the sudden death of the half-sister at Lahore with whom I had stayed on my way to Peshawar."

No one familiar with the modern researches in telepathy will have the slightest difficulty in explaining Gen. Roberts' mysterious dream. At the time of its occurrence, but unknown to him, his sister, several hundred miles away, was lying extremely ill, or, perhaps, had already died. Either herself or some member of her family attendant at her bedside was thinking of the distress which the news would occasion to General Roberts, and by telepathic communication, unconsciously to both sender and receiver, his mind was affected with a vague feeling that a great calamity had happened or was about to happen to some near relative. In his sleeping condition his mind was free from disturbance, and receptive to such communications, as his previous experiences had shown it to have been on other similar occasions. Telepathic experiences are by no means uncommon. There is nothing supernatural about them, and ordinarily they excite little or no attention. It is, for example, a very common occurrence that one's mind is suddenly and unaccountably turned upon some person whom he has not seen nor thought of for months or years, and within a few moments, perhaps while still thinking or speaking of him, that person makes his appearance. With the writer, even while yet a young man, that sort of coincidence was so frequent, and sometimes so amazing, as to attract his attention and cause him to speculate upon the meaning of the strange phenomenon; with the result that he became, at that time, firmly convinced of the existence of some mysterious power of the mind to communicate directly with other minds. The word "telepathy" was not then known; but the underlying fact had been dimly recognized from time immemorial, and had been signified by current phrases, of homely import, used among English speaking peoples, such, for example, as "The Devil is always near when you are speaking of him," or "Speak of angels, and you will hear the rustle of their wings." Within the last thirty years scientific investigation has brought the subject more prominently to public attention, and added largely to our knowledge of the facts; with the result that the existence of "this strange faculty" is now generally recognized.

Such a faculty, although unquestionably possessed by the mind, is entirely unnecessary for our existence in this life. The physical organs of sight, hearing, speech and touch are all that we need here either for communicating or receiving information; and nature has provided no organs, nothing but the naked mind itself, for the exercise of that other faculty; thereby indicating unmistakably that she concurs in deeming its exercise unnecessary in this life. But what of the future life, where we shall be destitute of the physical body and its organs, and shall have to live as naked souls—

shall we not need such a faculty there? How could we get along without it? The soul will need some mode of communication with others there, no less than it does here: but it will not need our organs for speaking or hearing, because they are material and are adapted to be operated only through a material medium, the atmosphere; it will not need our sense of touch, because that can be excited only by contact with material things; and it will not need our eyes, because they are useful only to transmute the vibrations of ether into corresponding vibrations of the optic nerve. How, then, will mind be able to communicate with mind in the future life?

We answer that, in telepathy, we have already seen that, even in this present life, mind can communicate with mind directly, and without organs. There exists, therefore, some medium by which such communication can be, and actually is, effected. That medium is presumably the luminiferous ether, an immaterial substance which fills all space and within which the soul must always dwell, whether in or out of the body. That medium is exactly adapted for the purpose of communicating to a distance, and we utilize it for that purpose even in this world. With a battery or magneto and a wire, we use it for our telegraphs and telephones; and, without the wire, we use it in what is called wireless telegraphy. To explain the mystery of the communication of intelligence from one to another, through any intervening distance in the future life, it is only necessary to assume that in telepathy the mind demonstrates its power to use the ether without battery, magneto or wire.

Clairvoyance is probably but a phase of telepathy; for it seems as reasonable to suppose that another mind can as easily communicate to us, from any distance, a perception of the *forms* which it sees, as it can communicate to us knowledge of the *facts* which it sees or the emotions which it feels; for, after all, the difference consists merely in communicating by pictures instead of by words, which are only the conventional representatives of mental pictures. We know that a landscape, by means of etheric light-waves, produces a shadow-copy of itself upon the distant photographic plate: may not the mental landscape, existing in the mind of the spectator, produce, by the same means, a shadow-copy of itself upon the distant mind? This would explain why the clairvoyant experiences a consciousness of seeing the event or scene as though he were personally present at it.

There has been so much humbug and deception practised under pretense of clairvoyance that the very word has been, almost from the first, strongly suggestive of fraud. From this cause, many persons have come to believe that there is no reality in it, and, even when the clairvoyant is known to be thoroughly truthful, have charitably tried to account for his supposed experiences on the theory of temporary hallucination. But there is no reasonable doubt that clairvoyance is a fact. Swedenborg, in describing what he saw in the spirit world, may have been the victim of hallucinations; but in describing in detail, at Gottenburg, Germany, an event which he saw taking place at that moment, in Stockholm, Sweden, three hundred miles away, and which was afterwards found to have taken place there exactly at the time and in the manner described by him, he was certainly under no illusion. Nor was Miss Ray under hallucination in describing at her father's breakfast table in Washington, D. C., the burning of her relative's building twenty miles away, in Virginia, which had taken place during the night just past, and which had been seen by her in a dream.[1] There must be some rational explanation of these strange phenomena; is there any more reasonable explanation than that here indicated? What do we know about photography, mental or otherwise, or even about sight itself, except that things have the power of copying themselves whenever they find something that is sensitive to etheric vibrations, upon which to make the copy?

"Mind-reading" is undoubtedly a telepathic phenomenon; and it is an interesting fact that, in mind-reading, the experiments made by the Society for Psychical Research, at London, and detailed by Mr. Podmore in his book, *The Naturalization of the Supernatural,* show that the mind of the reader seems to see, indistinctly, *pictures* of the objects that are, at the moment, consciously in the mind that is being "read." The mind, then, must certainly have the power to transfer to another mind, and sometimes at a considerable distance, an image of the thing of which it is thinking. The observed facts thus indicate clearly that the mind not only has the power to excite etheric vibrations that may reach and affect another mind, but to excite them in such a way that they correspond in "form" (that is to say, in magnitude, rate and force) to the light-waves that produce a photographic picture. In other words: mind A photographs more or less distinctly upon mind B a copy of the thing seen either actually or in imagination by mind A.

The wife of one of my acquaintances used to give her husband, on his return from business trips, most startling accounts of events in which he had participated during his absence and of which he had not informed her, describing

[1] Miss Ray was a young lady of prominent social position at Washington. The event here referred to was fully reported in the Washington newspapers at the time, and the coincidence of the dream and the fire was verified by them.

persons, places, and conversations, with the utmost clearness and accuracy. Volumes might be filled with the details of similar well-authenticated cases.

Probably, many, and perhaps all, of these cases could be explained by the theory of telepathy. The power of hypnotic suggestion to make the subject believe that he actually sees the thing or event suggested, is well known. If that power of suggestion be exercised telepathically, it would account for most of the cases of clairvoyance.

A few years ago, a lady was riding in an omnibus in Paris, and passing the old church of Saint Thomas d'Aquin, with which she was familiar, was surprised to see that it had been frescoed in a new, original and striking way. Desiring to inspect it more closely, she returned by the same street a few hours later, and found to her amazement that she had been the victim of an illusion—the church had not been redecorated, but was exactly as she had seen it long before that morning! A few months later she mentioned the strange occurrence to an acquaintance in New York, describing vividly the composition and coloring of the frescoing that had so mysteriously appeared and vanished, and which unquestionably, to his mind, was an old Italian work. He asked the lady to accompany him to the studio of a young American artist, who had spent some years studying in Europe. There he showed her a large copy made by this artist in a small Italian town. She recognized every detail of the fresco she had seen on Saint Thomas d'Aquin, as she went by in the omnibus. The incident is well authenticated. It has been suggested, as a possible explanation of the mystery, that the artist was passing through Paris, on his way to America, and happened to be in the omnibus when the lady experienced the illusion; that upon seeing the church, the Italian fresco was vividly brought to his mind, and that, in imagination, he applied it to the edifice; and that, unconsciously both to himself and the lady, what he saw with his mind's eye, she, by hypnotic suggestion telepathically communicated, seemed to see with her physical eyes. Whether this explanation be correct or not, can never be determined. But the facts of telepathy and clairvoyance reveal the existence of mental powers totally inconsistent with Spencer's theory of the evolution of the mind, and totally inconsistent with the fundamental dogma of materialism.

The facts that the soul, in the future life, will dwell in a medium which is capable of transmitting vibrations, and that vibrations, when harmoniously or rhythmically arranged, excite pleasurable mental emotions, concur to indicate that we may reasonably expect to enjoy music in the future state of existence. Music is a form of universal language, through which one soul is able to impress another, almost to ecstasy, with the purest, grandest, and most beautiful sentiments and emotions. Like a fine oration or a poetical masterpiece, its direct action reaches and affects only the mind. In itself, it is as pure as the ether; and if at any time you hear a musical strain spoken of as "sensuous," it is only because the person who so speaks of it has, through some previous experience, learned to associate it with impurity. As it is produced only by vibrations arranged to follow one another in a certain order, there is no conceivable reason why the ether should not be used to produce those vibrations. Indeed, Dr. Cahill is even now exhibiting in New York a magnificent orchestral instrument, of his invention, in which all the sounds are produced by electrical impulses, and are reinforced by material instrumentalities only to give them greater volume. Musical vibrations, which he produces even in this world by the ether, can certainly be produced in the next world through the same medium.

Our imaginations will undoubtedly go with us to the next world, with all their powers of creating and enjoying the beautiful and sublime, together with our power of extending that enjoyment to, or receiving it from, others. With souls freed from the body, and therefore no longer subject to heat, cold, hunger, thirst, fatigue or confinement, and in a world where we are vouchsafed every mental and moral faculty that we now possess, why should not our future life be a happy one—unless, indeed, memory should torture us with the recollection of our lost opportunities, or our evil deeds in the present life? Such recollections would be an eternal punishment; for lost opportunities can never be recovered, and evil deeds leave a stain which it may be difficult to wash out.

In these reflections, we are not presuming to guess or speculate about what will be the conditions of the future life. We treat the subject as a matter for scientific inquiry, basing our conclusions only upon known facts. It is too serious a matter to admit of speculation, or to justify giving expression to the baseless dreams of the imagination. But so far as God has given us facts, with reason to lead us to their meaning—so far, and no farther—we feel justified in making known our conclusions.

We can hardly conceive that the human soul, entering upon its new life, will find itself deprived of faculties or powers which it has in this world; for we have no reason to believe that it will be newly created or materially changed during its transition to the world of spirits. Undoubtedly, what it will be, it already is; for, otherwise, the personality that is to survive there would not be the same as that which had existed here

We shall go there, then, with the memory of what had occurred here—probably with a memory clearer and more complete than we had ever manifested here; for it will not be hampered with the accidental or inherited imperfections of a brain and nerve mechanism through which alone it had been obliged to act in this world. That memory will carry with it the power of speech, that is to say, the power to represent thought by arbitrary arrangements of etheric vibrations—for, in its ultimate analysis, that is all that there is in speech or language, whether here or elsewhere.[1] Surrounded with a medium perfectly adapted to those vibrations, there is no reason why the mind should not be able to communicate directly with other minds, not dimly and by vague impressions, but with a clearness and definiteness impossible under the restrictive conditions of our present environment.

The fact, verified as it has been by scientific investigation, that telepathy is no chimera of the imagination, but is the manifestation of a power common to all minds, seems to settle four great questions:

1. It renders tenable and reasonable the belief in the essential principle of modern spiritism—notwithstanding all the humbuggery practiced by the charlatan "mediums" who make their living by it; for it indicates how it may be possible for spirits in another world to communicate with minds here. For the same reason, it justifies the belief in guidance by supernatural intelligences or "guardian angels," and in the reasonableness of venerating the saints.

[1] When we read, the written or printed words cause certain etheric vibrations or impulses to reach the mind through the optic nerves and the brain, which translates and understands their meaning. In hearing speech, or in reading by the fingers, the impulses reach the brain through other nerves. On the nerve-telegraphs, these impulses are evidently of an etheric character.

2. It removes the ecclesiastical doctrine of Divine Revelation from the category of superstitious fancies, by stripping from it the burden of supposed "miracle," and explaining it as in accordance with the laws of mind.

3. It renders inconceivable both the assumption that the mind is material and the assumptions that it has evolved from matter or is a function of the brain. The telepathic powers of the mind are utterly inconsistent with all forms of materialism.

4. It gives a finishing blow to the assumption that evolution is a general law of nature.

Herbert Spencer, in his *Principles of Psychology,* contended that man's intellectual powers and his moral faculties are the products of evolution. So far as man's intellectual powers are concerned, the evidence in support of Mr. Spencer's contention is very unsatisfactory, and in many instances plainly contradicts his theory. It is, indeed, necessary to educate the intellectual faculties in order to render them fully available for the purposes even of this life; for no person is born with an innate knowledge of geography, grammar, history, literature, mathematics, or the sciences. These things have to be learned. But teaching a faculty that already exists is a very different thing from creating the faculty itself. It must be created, before it can be instructed. The many well-authenticated instances of prodigies, manifesting extraordinary intellectual powers even in childhood, are fatal to Mr. Spencer's theory. No theory of evolution can account for Zerah Colburn's being able, at six years of age, to solve correctly in twenty seconds and by mental processes alone, such questions as: "How many days and hours in 1,811 years?" or, at nine years of age, by the same processes, to solve correctly in a few seconds such questions as: "What is the square of 999,999 multiplied by the square of 49 multiplied by 25?" Genius is not the product of evolution nor of heredity; for if it were, Napoleon would not have become master of Europe at the age of thirty; Von Haller would not have been writing essays in the Greek language and compiling Hebrew and Chaldee grammars at the age of ten; Mozart would not have given evidence of his extraordinary musical faculty at four, and have become an admirable composer at six; Burns and Byron, in their short lives of thirty-seven years, would not have achieved immortal fame for intellectual genius; "Blind Tom," a negro idiot, under legal guardianship all his life, would not have become, even while in childhood, an expert in musical performance; Alexander Hamilton would not have been an honored and able leader of American thought and action at the age of twenty; and the uneducated Lincoln, master of eloquence, argument and statemanship, would never have risen from a backwoodsman's log cabin to the Presidency of the United States and a secure place in history by the side of George Washington. The intellectual faculties of the Deity, which we see manifested in the works of nature, surely did not originate by evolution. This single example wrecks the whole fabric of Spencer's elaborate argument.

I have no greater faith in his theory of the genesis of the moral faculties than in his speculations on the origin of the intellect. The nature of the subject, however, makes it difficult to establish by tangible evidence the actual existence of a distinctive moral sense or "faculty" as an innate element of the mind; and this difficulty lends a certain degree of superficial plausibility to his argument that the moral sense is a product of evolution.

But, before we proceed further with our discussion, let us be sure that we clearly understand our terms. Evolution does not mean *creation,* but only development. Before development can take place, there must be something to develop. A tree can develop out of a seed; but neither a tree nor anything else can develop out of nothing. Like a tree, the moral character is the result of development; and, like a tree, there must have been a something, a moral germ, out of which it could be developed. When fully developed, it towers above its source, branching and flowering into the moral sentiments, and is strong and very beautiful; but its form is the result of the innate life-force, urging it upward while the conflicting forces of its environment are acting upon it and gradually modifying and shaping its growth.

In other words, it is necessary to assume the existence of an innate moral faculty, to begin with; then, and not till then, it is easy to account for the moral sentiments as developed from it by exercise. But when Spencer declares, in effect, that "permanent and universal moral sentiments, with their correlative moral principles," result from the "evolution of mind by the accumulated effects of experience" he confuses his terms and thus spoils his argument. For it is not the evolution of mind in general, but the development of a particular faculty of the mind that results in permanent and universal moral sentiments, with their correlative moral principles. The distinction is rendered clear, from the argument which immediately follows the passage above quoted, and in which Mr. Spencer bases his "Evolution of moral feelings and ideas" upon "the multitudinous cases in which actions are determined and made habitual *by experiences of pleasurable or painful results*" without the slightest mental association of those actions with any possible benefit or injury that could in any way result from them. For, unless there is an innate moral faculty, why should pleasure result from a good act, or pain from a bad one, in the absence of any intellectual perception of beneficial or injurious consequences? His very statement shows that the result can be accounted for only upon one hypothesis, namely, the existence of an innate faculty which spontaneously approves good and disapproves evil. Mr. Spencer, to make his meaning perfectly clear, proceeds to distinguish between this spontaneous approval of good and disapproval of evil, on the one hand, and, on the other hand the more deliberate approval or disapproval that results from an intellectual perception or realization of the practical benefits ("utility") or injuries ("inutility") resulting from such acts, saying: "But such intellectual recognitions of utility *do not precede and cause the moral sentiments. The moral sentiments precede such recognitions of utility, and make them possible.*" All this is plainly equivalent to saying that the spontaneous or intuitive moral faculty acts instantly and without regard to results, because it is its nature so to act—it cannot do otherwise; but that the intellectual faculties act more slowly, basing their conclusions upon their experience or observation of the consequences that generally result from such acts.

It follows from this, that the "acts" of the innate moral faculty are mere blind impulses of attraction towards what is morally right and repulsion from what is morally wrong. The possession of such a faculty is not equivalent to the possession of moral character, nor equivalent to the possession of conscience; but it furnishes the necessary foundation for both. If only there be superadded to it the *knowledge* of what is salutary and what is injurious, then we have both conscience and moral character.

Thus the moral faculty itself is innate and automatic. It comes directly from the hand of the Creator; and is no more susceptible of education or change than is the attraction of gravitation or of the needle to the magnet. But the knowledge which unites with it to form conscience and character is not innate, but is an intellectual acquirement based upon past "experiences," and therefore susceptible of education and change. A resulting conscience or moral character may thus by faulty education be temporarily misled into the honest approval of that which, in the light of further knowledge, would clearly be seen to be wrong. Hence, we judge men leniently when we see that their errors are the result of a wrong education; for the wrong which they do does not indicate the absence of the innate moral faculty, but only the mistake made by their intellectual faculties.[1]

In training the moral character, the purpose is two-fold, namely, first, to develop a clear and correct intellectual judgment as to what is intrinsically right and what is intrinsically wrong, and, secondly, to develop and strengthen the will to do what is right and avoid or oppose what is wrong. The natural (or innate) tendency of every person is to do what is right; and this he would inevitably do in every instance if he knew what was right and were free to do it. But he is not free—a thousand temptations assail him on all sides, urging him to disregard his sense of right and to do what appears at the time to be for his personal interest. Life thus becomes a never-ending succession of

[1] The defect in Mr. Spencer's argument resulted from his confounding the *moral sentiments* with the innate *moral sense or faculty*. It is the *moral sense* that precedes "the intellectual recognitions of utility, and makes them possible." The moral *sentiments*, as he correctly states, do not precede, but *follow* such recognitions of utility, and are the joint product of them and the moral sense or faculty.

Spencer had undertaken the impossible task of deriving everything from nothing, by the processes of evolution. Hence, the result of his argument is, that his "moral sentiments" are left suspended in the air, with their origin wholly unaccounted for.

struggles between his sense of duty and his self-interest—between *right* and *self.*

The story of Adam and Eve is an allegorical myth. Written thousands of years ago by some unknown but thoughtful mind who had pondered much on the problems of human life, it was evidently intended, not as an actual history, but as an allegorical fable typifying actual conditions; and as such, there are important lessons to be learned from it. The only wonder is, that there has ever been any doubt of its real character as a literary production.

According to the allegory, Adam and Eve, the last and most important of God's creations, were formed from the dust of the earth, and vivified by the breath of their Creator. With that breath, they received intuitive moral sense, and felt, but did not intellectually know, the difference between good and evil. They were therefore innocent and pure, as every soul is until it has been subjected to temptation. Their Creator permitted them to enjoy all the pleasures of life (in allegorical language, permitted them to eat the fruit of the garden in which they found themselves) but showed them one tree in the center of the Garden, where it was accessible to all, and told them not to eat of its fruit lest they should die.

Then came the Tempter (the devil of self-interest) and told them that the forbidden fruit was delicious, and that it would not kill them, but would only open their eyes to the knowledge of good and evil and make them become as gods. They yielded to his persuasion, ate the forbidden fruit, and became as gods, intellectually, knowing good and evil. Innocent no longer, they were no longer fit for the Garden of innocence, and were banished from it.

That story, in its essential elements, is as true today as it was in Adam's time. That same old devil of self-interest is the author of all the moral evil that exists in this world, and of all the physical suffering that has directly or indirectly resulted from it. He has access to us at all times, and his persuasive powers are exceedingly hard to be resisted. The perfect man would be he who, intellectually knowing good and evil, should have the moral strength always to do right and never wrong. We know of only one historic character who has exhibited such perfection.

The object of all correct moral education is, to train the character up fully to that degree of perfection. For such a training, no better conditions can be conceived of than those attending this life on Earth. We stay here long enough to be subjected to every selfish temptation that flesh or mind is heir to; and, in most cases long enough to realize the folly of yielding to them.[1] We are surrounded by conditions which tend to entice or force us from the paths of rectitude and altruism and by other conditions which equally tend to antagonize such misleading influences. Under such opposing conditions, the intellect cannot but be instructed and the moral will strengthened. On the other hand, self-interest is insidious and powerful. Its prizes are immediate and alluring. Placed closely before our eyes, they hide everything that is farther away, and thus deceive us as to the real situation. We need every aid that we can get, to counteract these influences. And we are not without such aid. As Herbert Spencer truly remarks:[1] "Approbation and reprobation, divine and human, come to be associated in thought with sympathetic and unsympathetic actions respectively. The commands of the creed, the legal

[1] It is conceivable that, in cases where life is prematurely cut off, the course of instruction may be finished in the other world, under the tuition of relatives, friends, or other teachers who have profited by their experience in this life.

[1] *Principles of Psychology,* p. 531.

penalties, the code of social conduct, unitedly enforce them; and every child as it grows up, has daily impressed on it by the words and faces and voices of those around, the authority of those highest principles of conduct."

The result is, that the mind is trained not only to know, but to realize, the folly of evil. I doubt if there is a criminal so hardened in sin that in his moments of calm thinking he does not feel that it would have been better for him to have lived an honorable and upright life. But associations are strong and moral will weak; and there are few who find themselves able, here in this world, to break away from the old influences. The disposition to break away from them is, after all that can be said, the real test of character. If the disposition is strengthened by our experiences here on Earth, then life, even though it may not have made the best use of its opportunities, cannot be called a failure; for that which tends, in any degree, to better fit us for an eternal existence cannot but be regarded as of infinite importance.

In chapter XIX, considering the attributes of God, as revealed by Himself in the physical works of nature, we came to the question whether those works furnish complete evidence of His attributes, and said: "Only in two respects do they fall short, namely, in that they do not reveal His moral nature nor His Prescience. It is impossible that they should reveal His moral nature; for that can be made known only in two ways, to wit, firstly, by the creation of moral agencies and the government of them by moral laws, and, secondly, by direct revelation of His moral purposes—neither of which subjects has come within the purview of our discussion, up to this point. Nor have we had occasion to touch upon the subject of Prescience. But when we shall come to consider Man and the question of his immortality, it is possible that the revelation of God may be completed."

It was not possible that the physical works of nature should reveal God's moral attributes, because the moral is entirely apart from the physical and there is no relation between them. But the creation of Man with a moral sense furnishes the evidence of God's moral sense. As we have seen, the moral sense or faculty, considered by itself alone, is simply an intuitive predisposition to good and aversion from evil. To perfect a moral character, this intuitive moral sense must be combined with a complete intellectual realization of the utter inutility of evil—inutility not only to ourselves, but to all other beings. In God alone is there an absolute knowledge of all things past and present. But the future grows out of the past and present; hence, to a Being who has absolute knowledge of past and present, and absolute knowledge of the nature and laws of mind and matter, all things in the future must be foreknown with infinite certainty. To such a Being, there can be no past, present or future, but only one eternal *NOW*.

In man, therefore, with his intuitive but uneducated moral sense, is the revelation of God's attributes completed. It required the physical universe to make known His great creative and constructive Mind, His eternal and incorporeal existence, and His omnipotence, omnipresence, immanence, and omniscience. It required a moral agent, man, to reveal His implanting of a moral sense in His intelligent creatures; to discover that the moral sense thus implanted proves the existence of such a sense in the Divine Mind; and to see that such a sense, when combined with an intellectual knowledge of the consequences of good and evil acts, results in moral character and brings us nearer to the Divine standard of excellence.

CHAPTER XXIII.

Prevision.

The human mind has another power rarely exhibited but conclusively proved to exist, namely, the power of intuitive foreknowledge of future events, or, in other words, Prevision. How it can be possible for a person absolutely to foreknow a future event is, in this present sphere of existence, utterly inconceivable. We have no difficulty in understanding how he can, by processes of reasoning from facts already known, arrive at the conclusion that a specific event will probably occur, nay, that it is certain to occur, *if nothing shall happen to prevent it;* and we can calculate for thousands of years to come, the eclipses of the sun and moon, the occultations of the stars, the ebb and flow of the tides, and other events that recur regularly at certain periods in accordance with the known laws of nature; but how we can foresee that a particular person, in sound health, free to obey the dictates of his own volition and without any prearrangement on the part of himself or anybody else, will at a future time be at a certain place and there pass through certain specific experiences, is beyond our power to explain or understand. Yet, if human testimony is to be believed, many instances of such foreknowledge have occurred.

It is many years since it was possible for me to doubt the existence of this strange power of the mind, since, in early youth, I personally witnessed an event which conclusively proved its existence and made a vivid and ineffaceable impression upon my memory. The interest and importance of the subject justify a statement of the facts in detail.

At that time, my father, Isaac Hill, was living in the town of Lincolnville, about seven miles from Belfast, Maine. My mother had a brother, Gilbert Hall, who, from his early manhood had been a sailor, accustomed to make long voyages to the East Indies, the Mediterranean, and other distant parts, and, although intelligent and fairly educated, seldom or never while absent communicated with the family at home. My father was a man of education and intelligence, and a pronounced free thinker, relying upon the dictates of his own reason, and entirely free from superstition. One evening, the family were notified that we were to have an early breakfast the next morning, because my father would be obliged to spend the day at Belfast, on a matter of business. At breakfast the next morning, I was surprised to hear him tell my mother about a dream that he had had during the night—surprised and interested, because the telling of dreams was the violation of a rigid rule of the family—my father had strictly forbidden it to all the members of the family, on the ground that dreams were vagaries of the imagination, due to restlessness and unsound sleep, and that to tell them not only excited superstitious notions in the minds of the children, but tended to superinduce the habit of dreaming. Yet here he was, telling a dream himself! I clearly remember the astonishment which that fact produced in my mind, and the interest which the subject of the dream, and his manner of telling it, further aroused as he went on.

He commenced by saying that never before in his life had he had a dream that resembled it; that he seemed not to be asleep, but wide awake, and the imaginary occurrences of the dream produced on his mind so strong an impression of verity that, since rising, he found it difficult to disabuse his consciousness of the impression that the events of the dream were actual experiences through which he had passed while awake—he remembered them as facts, and not as a dream. He then went on to say that, in his dream, the morning had come, he had got an early breakfast, entered his carriage, and taken the road to Belfast; that, on reaching a spot about three-quarters of a mile from home, where began a long decline to a brook crossed by a bridge, known as Martin's causeway, he observed a man commencing to descend the opposite incline toward the bridge; that at first the distance was too great to enable him to make out who the pedestrian was, but he observed that he carried a light-colored overcoat hung over his arm; that as they came nearer each other, he thought the man looked like my mother's brother, Gilbert, and before they met he saw that it was indeed his brother-in-law. They met at the bridge, and, after the usual greetings, my father inquired how my uncle happened to be there at that time of the morning, saying that he did not know that his ship had arrived; to which my uncle replied that it had arrived at Boston two or three days before, and, after calling on his two sisters there, he had decided to run down to Maine and visit my mother, and had taken the boat for Belfast, intending to drive out to her home, but, on arriving at Belfast, he had found the morning so pleasant that he had abandoned the idea of driving and started on foot. There was some further dream-conversation between them, the particulars of which I do not remember, after which, according to the dream, my father resumed his journey to Belfast, and my uncle continued his way to our house.

I remember that at the conclusion of the story my mother remarked that she was not expecting my uncle and was not aware that he was in the country; and that, upon my father's rejoining that he could not get rid of the impression that he had actually met him at Martin's causeway, my mother said: "What a strange thing if you should meet him there!"

The breakfast was over, my father started for Belfast. About an hour after he had gone, I was startled to hear a sudden scream from my mother, who was in the hallway, and, turning to see what was the matter, I found that my uncle was just entering the door, unannounced! Her first words I shall never forget: "Did you meet Isaac?" nor his reply: "Yes, I met him exactly at the place—he told me of his dream, and everything took place precisely as he foresaw it!" I observed that he was carrying a light-grey summer overcoat hung over his arm.

At the supper-table, my father had returned, and the matter in all its details was rehearsed and discussed by the three. Not a single variation could be found between the dream and its fulfillment. To say that I was an interested listener, is to put it mildly—it seemed to me a miracle; and the facts burned into my memory an impression which has never been effaced, and never will be, as long as the brain retains its normal vigor. From that time, I have personally *known* that the power of intuitive foreknowledge is one of our mental faculties, however rarely it may be exercised, and however difficult of explanation it may be.

When I was about eighteen years old, an incident occurred in the neighborhood where I lived, showing the same strange phenomenon of intuitive foreknowledge of future events. A young man named Leeds was a cousin and neighbor of one of my classmates and intimate friends. He was employed in transporting kiln-wood and other merchandise down the river, upon a large scow. One night, the family were startled by wild shrieks from his bed-room. On entering the room, they found him sitting up in bed in a condition of agonized terror. In response to their inquiries, he told them that he had been awakened by a frightful dream, in which he seemed to be on his boat going down the river, and, on arriving at the bridge at Thomaston, the boat swerved from its course in consequence of the swift current, struck one of the piles of the bridge, and caused the draw to fall on his head, breaking his neck. A few days after the dream, he was killed at the spot designated, and in exactly the way foreseen. There never was such an accident on that river before, nor has there been one since. The recollection of my father's experience caused me, within a few days after the accident, to make particular inquiries of my classmate as to the current reports of the warning dream; and I give the circumstances as he related them to me, and as I had already heard of them through public rumor. I may add that I knew my classmate intimately till his death a few years ago, and that his life-long reputation for truthfulness was irreproachable.

The two cases referred to are mentioned here because they were practically within my own knowledge. Since the time of Pilate's wife, many similar incidents have been recorded and published. But history, as formerly written, was an unreliable witness, too indolent or credulous to make any effort to verify her narrative; and the consequence is, that, with the exact methods of modern investigation, we find ourselves obliged to reject the greater portion of her supposed treasures as worthless. But well authenticated modern instances of intuitive foreknowledge are known, such, for example, as that of Colonel Garesché, which was widely published and commented upon, in this country, in the early days of 1863. Colonel Garesché was a brilliant young officer, chief of staff to General Rosecrans, who commanded the northern army in Tennessee. Late in 1862, he was warned in a vivid dream, several times repeated, that he was to be killed in the first battle in which he should thereafter be present. Although a brave officer, he was strongly affected by the persistent recurrence of this dream; and he told some of his fellow officers about it, and made his will. In the first battle which thereafter ensued (the battle of Stone River, December 31, 1862), he was instantly killed at General Rosecrans' side by a cannon ball which carried away his head.

An interesting incident is related by Carl Shurz in "The South After the War"[1]. The Tiedemann family, of Philadelphia, were old friends of General Shurz, who had been associated with Tiedemann in the German disturbances in 1848, and, like him had afterwards sought an asylum in America. Summoned to Washington by President Johnson early in the summer of 1865, Gen. Shurz went by way of Philadelphia, and, on the way, spent an evening at the Tiedemann residence. The family had become interested in spiritualism, and one of the daughters, a bright girl of about fifteen years of age, had developed the powers of a writing "medium." While he was at the house, it was resolved to have a séance. After what purported to be a communication from Schiller, occurred the following, which I give in the words of General Shurz:

"After several minutes had elapsed, the girl wrote that Abraham Lincoln's spirit was present. I asked whether he knew for what purpose President Johnson had summoned me to Washington. The answer came: 'He wants you to make an important journey for him.' I asked where the journey would take me: 'He will tell you to-morrow.' I

[1] *McClure's Magazine*, April, 1908, pp. 658-659.

asked further whether I should undertake that journey. Answer: 'Yes, do not fail.' (I may add, by the way, that at that time I had not the slightest anticipation as to what President Johnson's intention with regard to me was; the most plausible supposition I entertained was that he wished to discuss with me the points urged in my letters.)

"Having disposed of this matter, I asked whether the spirit of Lincoln had anything more to say to me. The answer came: 'Yes; you will be senator of the United States.' This struck me as so fanciful that I could hardly suppress a laugh, but I asked further: 'From what State?' Answer: 'From Missouri.' This was more provokingly mysterious still; but there the conversation ceased. Hardly anything could have been more improbable at that time than that I should be senator of the United States from the State of Missouri. My domicile was in Wisconsin, and I was then thinking of returning there. I had never thought of removing from Wisconsin to Missouri, and there was not the slightest prospect of my ever doing so. But—to forestall my narrative—two years later I was surprised by an entirely unsought and unexpected business proposition which took me to St. Louis, and in January, 1869, the Legislature of Missouri elected me senator of the United States. I then remembered the prophecy made to me at the spirit-séance in the house of my friend Tiedemann in Philadelphia, which during the intervening years I had never thought of. I should hardly have trusted my memory with regard to it, had it not been verified by friends who witnessed the occurrence."

I will not attempt to account for, or explain, the strange occurrence narrated by General Shurz. His word is a sufficient guarantee that it took place substantially as described by him. Those who believe in spiritism will find no difficulty in accounting for it on the theory that the message which Miss Tiedemann thought she received was a communication from the spirit of Abraham Lincoln. Those who are not prepared to accept that theory have no other alternative, so far as I see, except to assume that it was a manifestation of that strange power of the human mind to foresee future events, of which I have already given several examples. If it was a message from another world, it proves that the mind of man continues to exist after the death of the body. If it was a manifestation of any power of the mind itself to foreknow future events, it puts an end to all Haeckelian and Spencerian theories of the spontaneous generation of life and of the evolution of mind from matter.

An incident occurred in the life of the actor, Richard Mansfield, which is worthy of reference here. I give it in his own words, narrating, in his lecture before the faculty and students of the University of Chicago, in February, 1898, the pitiful experiences through which he passed in his early professional career. After describing the desperate condition to which he had become reduced at the time of the incident, he continues as follows:[1]

"This was the condition of affairs when a strange happening befell me. Retiring for the night in a perfectly hopeless frame of mind, I fell into a troubled sleep and dreamed dreams. Finally toward morning this fantasy came to me. I seemed in my disturbed sleep to hear a cab drive up to the door in a great hurry. There was a knock, and in my dream I opened the door and found D'Oyly Carte's yellow-haired secretary standing outside. He exclaimed:

"Can you pack up and catch the train in ten minutes to rejoin the company?"

"I can," was the dream-land reply. There seemed to be

[1] See *Scribner's Magazine* for September, 1908, pp. 307, 310.

a rushing about while I swept a few things into my bag, then the cab door was slammed and we were off to the station.

"This was all a dream, but here is the inexplicable dénouement. The dream was so vivid and startling that I immediately awoke with a strange uncanny sensation and sprang to my feet. It was six o'clock and only bare and gloomy surroundings met my eye. On a chair rested my traveling bag, and through some impulse that I could not explain at the time, and cannot account for now, I picked it up and hurriedly swept into it a few articles that had escaped the pawn-shop. It did not take long to complete my toilet, and then I sat down to think.

"Presently, when I had reached the extreme point of dejection, a cab rattled up, there was a knock at the door and there stood D'Oyly Carte's secretary, just as I saw him in my dream. He seemed in a great flurry, and cried out:

"Can you pack up and reach the station in ten minutes to rejoin the company?"

"I can," said I calmly, pointing to my bag, "for I was expecting you."

"The man looked a little startled by this seemingly strange remark, but bundled me into the cab without further ado and we hurried to the station exactly in accord with my dream. That was the beginning of a long engagement, and, although I have known hard times since, it was the turning point of my career.

"How do you account for the dream and its realization?" exclaimed Mansfield in answer to a rather incredulous question. "I have already said that I have no theory whatever in regard to the matter. I do not account for it. It is enough for me to know that I dreamed certain things which were presently to be realized in the exact order of the dream.

Having no superstitions, it is impossible to philosophize over the occurrence. All I know is that everything happened in the exact order that I have stated."

Another remarkable instance of foreknowledge of future events occurred at London, England, in the latter part of March, 1903, and was witnessed by a number of well-known people, among others Mr. W. T. Stead, the Editor of the *Review of Reviews*. Mr. Stead had invited several distinguished guests including Earl Gray, the Servian Minister, Mijatovitch, and others, to assemble at his rooms, on March 20, 1903, to witness some experiments in clairvoyance. The conditions were not favorable and the experiments were at that time unsuccessful. The clairvoyant was a Mrs. Burchell, whom Mr. Stead describes as a simple, unread Yorkshire woman from Halifax (England), of whose psychic powers he had heard good reports. Mr. Stead, who is my authority for this narrative, continues his statement as follows:

"As a kind of consolation for my disappointed guests, I invited a score of them to dinner at the restaurant Gatti and Rodesane, in the Strand. After dinner several of them left and about ten to twelve remained behind. As conditions were better I proposed to give Mrs. Burchell another chance.

"Various articles were placed in her hands concerning which she made statements more or less surprising, but not of historic interest.

"At last a Servian gentleman present, whose nationality was unknown to the clairvoyant, handed her a sheet of note paper on which was written the autograph of Alexander. Nothing was said as to the person from whom the writing came. No questions were asked and no information was given.

"Mrs. Burchell did not open the paper, but held it folded in her hand. She had hardly grasped it when she exclaimed:

" 'This belongs to royalty.'

"Then, becoming very excited, she fell from her seat and was only saved from striking the floor by her neighbor, who caught her. She exclaimed in great agitation:

" 'Terrible, terrible!'

"Then she collected herself and said:

" 'This is a bloody scene; there is murder being done. I see the inside of a palace. There are a King and a Queen. They are together alone. Then men, soldiers, burst into the room and attack them. They kill the King. He is dead. And the Queen, oh, how she cries for mercy and begs for her life! But I fear for her. I cannot see whether she escapes or not. The King, he is killed. Oh, it is terrible.'

"Only the Servian gentleman and myself knew that the sheet of paper bore the King of Servia's signature. As for the clairvoyant, I doubt very much if she knows where Servia is, or that such a monarch as Alexander existed.

"After the party broke up my Servian guest reported to Mijatovitch, the Servian Minister, what the clairvoyant had said.

"Mijatovitch came down to see me for confirmation. I repeated to him as exactly as possible what had taken place.

"He went home and wrote urgent private dispatches to King Alexander, warning him and begging him to be on his guard, not only when he went abroad, but especially against an attack that might be made upon him in the palace.

"The warning was in vain. The King and Queen were assassinated in their palace as the clairvoyant had foreseen three months before.[1]

"Of the absolute truth of this I can vouch of my own knowledge. So can all my other guests. The evidence of the Servian Minister is conclusive confirmation as to the prediction and its date."

There can be no doubt that Mrs. Burchell, in England, foresaw in detail a tragedy that was to occur more than two months afterward, in Servia, and in which the King and Queen would be slain by a band of assassins.

In the *Chicago Tribune,* of January 21, 1902, appeared the following special dispatch:

"Pittsburg, Pa., Jan. 20.—The dreams of Edward Glaub of Ross Station on the West Pennsylvania road came true. Three nights in succession he dreamt that his little six-year old sister Mary was burning to death. Yesterday afternoon, she, with a number of others, was skating at Ross Grove. There were about a dozen boys in the skating party, including the girl's brother, Edward, aged 16. A fire was built by the skaters.

"Mary was standing near the fire when the flames blew against her clothes, setting them on fire. Her brother tore the burning clothes from the girl.

"She was taken home and a physician called, but despite his efforts the child died a few hours afterward. Edward's hands and arms were badly burned."

It will be observed that the instances of prophetic foreknowledge above mentioned were manifested in two different ways, to wit: all except two, in dreams; those two (narrated, respectively, by Gen. Shurz and Mr. Stead), in the utterances of so-called "mediums" during the condition which they style "trance," in which they profess to receive

[1] The assassination was on June 11, 1903.

spirit-communications from the other world. As the prognostications above referred to were all verified by the subsequent happening of the predicted events, the necessary inference seems to be that, in sleep, the human mind occasionally passes into the state or condition which the spiritualists call "trance," and, while in that condition, is able to exercise powers that are not available to it under normal conditions. And it may be remarked that, on awaking from these trance-dreams, the mind seems to distinguish between them and ordinary dreams by their greater vividness and by the impression which they produce of actual waking experiences.

Ordinary dreams are undoubtedly occasioned by physical causes; the body is not perfectly at rest; the brain, excited by fatigue, disordered by impure blood, or disquieted by nerves bringing to it sensations from other disturbed organs, is partially awake and its cells more or less active; the mind, dwelling within the brain and acted upon by its cells, unconsciously translates their confused reports into equally-confused ideas, and there flits before the mental vision a phantasmagoria of half-formed thoughts, shapes, memories and scenes. They are due to the action and reaction between the excited brain-cells and the indwelling mind, and have no significance beyond that. But the trance-dreams are not due to these causes. They apparently come directly to the mind itself, uninfluenced by the brain-cells; and they are, therefore, seen clearly and distinctly, and leave a strong impression of reality.

Thus there are two entirely different kinds or classes of dreams—the one, arising from physical disturbance; the other from telepathic communication. When the latter convey impressions of events or scenes past or present, they may have been caused by the influence of any other mind.

But when they convey accurate foreknowledge of future events, they must have been caused, directly or indirectly, by the only One who foreknows the future. I see no escape from this conclusion.

Another strange case of foreknowledge has just come to hand. Professor William H. Allen, an educator well-known in Nebraska, South Dakota, and elsewhere, and a man of the highest character, was five years ago warned in a dream that he would be involved in serious danger at about the time of his fifty-second birthday anniversary, and might lose his life; but that, if he passed over that crisis in safety, he would live till past the age of eighty. At the time of the dream, he was under fifty years of age, was in perfect health, and had no reason for expecting any misfortune in the early future.

On March 10, 1906, three days after his fifty-second anniversary, he suffered a light stroke of apoplexy, but in a few days he was apparently well again, and had resumed the discharge of his official duties as Superintendent of Public Schools at Edgemont, South Dakota. On the 24th of March, 1906, however, fourteen days after his first stroke, he suffered a second stroke which was instantly fatal. The facts are given in an affidavit by his widow, printed as an appendix, at the end of this volume.

Aside from the great interest of the fact that Professor Allen was forewarned at least two years prior to his sudden and fatal illness, the most remarkable feature of this strange case is that it indicates at once *free-will* and *predestination.* Professor Allen was informed in his dream that soon after his fifty-second birthday he would be in extreme danger of his life; he was repeatedly warned to guard against that danger; and was assured that if he passed that crisis successfully, he would live to be over eighty years of age. In other words, the danger would certainly be there (predestination); but he might avoid it by availing himself of the proper means—(free will). The Church has always insisted that predestination and free-will were both true; but men have been unable to reconcile these apparently conflicting dogmas. Now comes this prophetic dream in which both are treated as true, and of which its prophetic character is verified by its fulfilment! Are events predestined, in the sense that they are known beforehand to the Infinite Mind; and at the same time are men allowed to shape their own destinies as they will? All I can say is (what has so often been said before) that we *seem* to be able to do as we please, and at the same time we *know* that a man's death by accident or by assassination or other cause, has often been foreknown long before its occurrence. Predestination seems to be God's part in human affairs; free will, to be man's part. As we have no control over God's part, wisdom suggests that we should not bother our heads about it, but attend to our own business by taking care to do *our* part well.

CHAPTER XXIV.

Conclusion.

When we examine the so-called "theories" by which the atheist attempts to justify his atheism, it does not take long to ascertain that they are not "theories" at all, but simply conjectures and assumptions absolutely unsupported by evidence. Why any reasoning intelligence should suffer itself to be misled by them is utterly incomprehensible; for every one of them has been disproved, again and again, by unanswerable evidence.

Certain facts are decisive of both of the great questions discussed in this volume, sweeping away with irresistible force every false assumption relied upon by scepticism. Thus, one fact alone, the fact of creative contrivance in the works of nature, is decisive of the existence of an intelligent Creator. It can be explained on no other theory; and it cannot be refuted, for the proofs of it are found everywhere.

So, also, the fact that the human mind occasionally exhibits intuitive foreknowledge of future events is conclusive of the existence of God; because it shows that events are foreordained long before their occurrence. It is also, together with telepathy and clairvoyance, strongly persuasive of the survival of the soul after the death of the body. On no other theory can we account for the possession by the mind of these powers or faculties, which are obviously unnecessary in this life, but are plainly adapted to the conditions of a life in which the physical body will no longer clog the powers of the soul. When we consider that God is incorporeal and is eternal, we see that there is no inherent improbability in the doctrine of the immortality of the human soul. When we further reflect that the embodied soul has the power to think, to know, to will, to act, to understand, to judge, to choose, to remember, to contrive, to plan—all of which are attributes of the Almighty Mind as He has revealed Himself in nature, we are forced to the conclusion that as God is eternal, so must the soul of man be immortal. Many additional considerations present themselves to fortify that conclusion; and nothing can be alleged against it.

Nothing? Nothing but the unfounded conjectures of the atheist. He conjectures that life (and with it, mind), had its origin in the chemical action of matter upon matter; and therefore will not believe that it can survive the body. But if it be true that the mind ever, at any time, or under any circumstances, has been known to manifest intuitive foreknowledge of a particular future event; or if it be true that telepathy and clairvoyance are powers of the mind; then it cannot be true that life or mind is the result of chemical action or is from any material origin. But telepathy, clairvoyance, and intuitive foreknowledge are well known phenomena of mental action. There can be no doubt of their reality, and, therefore, no doubt that the idea of "spontaneous generation" is sheer delusion. The known facts are decisive against it; and there is absolutely no evidence in its favor.

Another equally unfounded conjecture is, that the mind is merely a function or result of brain action. The same facts, which were fatal to spontaneous generation are equally fatal to this conjecture also. And, further, science assures us, as we have seen, that mind is not the function or result of brain action, but is an immaterial something which, while here in the body, makes use of the brain to transmit to it information and to execute its orders. The brain is scientifically known to be a mere telegraph mechanism which acts, in part, automatically, and, in part, in response to the volitions of the mind. The intricacy of its construction, and the astonishing skill and ingenuity with which its millions of cells, ganglions, fibers and nerves have been combined together and adapted to coöperate in the performance of its functions, furnish clear and convincing proof of creative contrivance, but give no support to the vagaries of materialism.

Whence, then, came the mind—that mysterious, imponderable, intangible, immaterial entity that dominates the world, weighs the sun and planets, and reads the future? Is there any conceivable answer to that question except the answer given by Darwin in the last chapter of the "Origin of Species"? Certain it is that all the philosophy of materialism is powerless to explain the immaterial.

It is powerless even to explain the *material.* When it tells us that evolution accounts for the development of the body, it stands aghast in the presence of the enormous void spaces that separate the links of the evolutionary chain, and can only answer that "links" are "missing," and that guesswork must take their place. And finally, when it is forced to witness the substitution, by the osteoblasts, of bone for cartilage, and the excavation of the bone by the osteoclasts, a work where there are no "missing links" and no opportunity for conjecture, but everything is seen and known, it stands speechless and helpless. For here, there is obviously no evolution, but, on the contrary, a *discontinuance* of the old process of construction, and the creation of a new and different process to take its place.

We are, therefore, as intelligent and reasoning beings, compelled to the conclusion that he who said in his heart "There is no God" was rightly characterized as a "fool" and that he who says "There is no such thing as an immortal soul," belongs in the same category. For even the atheist cannot regard the works of nature without recognizing their obvious "mechanism," strangely forgetful of the fact that mechanism necessarily implies contrivance, and that there can be no contrivance without the exercise of mind.

There are millions of intelligent men and women who believe that they have had personal communion with God, and who find in their own experiences ample justification for their religious faith. So long as the world had no clear conception of the actuality of telepathic communication from mind to mind, it was natural that it should reject such revelations, and, indeed, all revelation, as fictions of an excited imagination or of pious fraud. Men thought that revelation, to be entitled to credence, ought to be delivered orally, in spoken words, as in an interview between God and man; or, at least that some Divine Power must take hold of the arm and compel it to write. Revelation, unsupported by evidence such as that, was deemed entitled to no consideration.

But with the knowledge that telepathy is an established scientific fact, there is no longer any reason for rejecting the testimony of credible witnesses that they are conscious of having had communion directly with the Divine Spirit. There may, indeed, be many enthusiastic devotees, and many other persons who are prone to mistake fancy for fact, whose judgment on such matters may not be entirely reliable; but there is no reason to doubt the testimony of thousands of pious men and women who conscientiously believe that they have communed personally with God.

This great mass of testimony to personal communion with God is, of itself, evidence that God exists and that the soul is immortal. Many persons feel the need of no other evidence upon which to base their religious faith, and are happy in the consolation which they derive from it.

On March 7, 1908, Otto Hauser, a Swiss archeologist, unearthed, at Moustier, Switzerland, the skeleton of a primeval man who had been buried there *with religious ceremonies* more than 500,000 years ago. The stratum of clay in which his bones were found was lower in the geological scale than that in which the Neanderthal skull had been discovered years before, thus proving beyond a reasonable doubt that the Moustier man's remains are the oldest yet known. They were exhumed in the presence of a number of scientists, who took careful notes of all the details, and verified the evidences of religious interment. The skeleton showed that man, five or six hundred thousand years ago, was hardly yet able to stand fully erect on his two legs, and that his chin and forehead had not yet completely developed. And yet that man, and those who buried him, believed in a future life! Where did they get that knowledge? They could hardly have got it from a contemplation of the wonders of nature, nor from any abstruse process of reasoning. But if some of them dreamed trance-dreams, as occasionally men do now, and if the prophesies of the dreams came true; or if mysterious premonitions warned them of coming events, as many persons have been warned in later times; then there is no occasion to wonder that more than half a million years ago men believed in a life beyond the grave, but only occasion to wonder that many of their descendants, with all the light of modern science, and with fully developed legs and chins, are, in some respects, not as wise as their remotest ancestors.

APPENDIX.

Affidavit of Mrs. Allen. (See page 309.)

I am the widow of William H. Allen, who died suddenly at Edgemont, South Dakota, on the twenty-fourth day of March, A. D., 1906, seventeen days after his fifty-second birthday. He was for several years before his death Superintendent of Public Schools at Edgemont.

Two years before his death, and when in full health, he had a strange forewarning that it would take place about the time of his fifty-second birthday, but that, if it should not occur at that time, then he would live on till past the age of eighty years. The particulars of that forewarning, as he related them to me, were as follows:

He had a vivid dream in which he seemed to see a chart of his life spread out before him, marked off in eight sections, each representing ten years. After the end of the last of the eight sections, the line was broken off. While he was examining these sections one after the other, and counting them, he observed a dark shadow across the line when he had passed over the end of the fifth section, and wondered what it meant. It seemed to be revealed to him that it meant that at that time sickness or danger of some kind would befall him, and he was warned repeatedly to be very careful of himself about that time, but that if he passed that crisis he would live until past eighty. He then began to examine the figure very carefully, to see if he could determine the exact time when this calamity would befall him. As the result of his examination, he decided that it would be about his fifty-second birthday, and about two months before his schools would close, for that Spring. All these were experiences of the dream.

On the tenth of March, 1906, my husband suffered a light stroke of apoplexy. In a few days he apparently recovered from it, and considered himself perfectly well again. During that time he told me that never a day had passed, since the dream, that he did not think of it, and that, since the holidays, and especially since his birthday, he had been expecting this illness; "But," he added, "now I am well and all right again, and I feel perfectly confident that I shall live past my eightieth year."

He resumed his official duties, and seemed to be entirely well; but on the 24th he returned home, complaining of feeling indisposed. After a time, while sitting in his chair, his head dropped, and he died instantly from a second stroke.

IDA ANN ALLEN.

Subscribed in my presence and sworn to before me this 28th day of May, 1909.

C. H. KUBAT,
Notary Public.

[L. S.]